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ABSTRACT

This volume illustrates how Canadian federal investment is advancing key measures of success in building research capacity at Ontario universities. Program descriptions illustrate federal investment in university-based research at 18 institutions of higher education in Ontario. A look at these programs shows that government-funded research is developing Canada's knowledge workforce and supporting the training of students who will transfer their skills and knowledge to the private sector. Government-funded research is expanding technological opportunities for firms to develop new products and processes, and it supports the creation of dynamic clusters of firms and knowledge flows essential to effective innovation. (SLD)

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A Sampling of

Success Stories

of

Federal Investment in University Research

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PREPARED BY THE ONTARIO COUNCIL ON UNIVERSITY RESEARCH

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Research Success Stories

Research and scholarship are part of the mission of every university—a venture into the unknown with no guaranteed outcome. Yet, as these *Success Stories* illustrate, federally funded support for university research has yielded some outstanding returns with very clear short- and long-term benefits.

When we think of returns on research investment, people most commonly think of the benefits arising from science and technology; however, it is worth noting that investments in scholarship and research in the arts, social sciences and humanities also play an increasingly vital role in creating an environment in which economic growth and prosperity can flourish, and in which all citizens will have the opportunity to enjoy a high quality of life.

Canada's economic competitiveness in the global knowledge economy matters. Our international competitiveness is directly related to our productivity. Our productivity depends upon our capacity for innovation. Innovation, in turn, depends upon having the right people in the right place with the most advanced knowledge and the desire to apply that knowledge to products and processes that can compete nationally and internationally.

Competitive research means that we are at the leading edge of breakthroughs and developments in socially and economically important fields such as health care, automotive technology, computing, environment, agriculture and the entertainment industry. Being at the leading edge of research means that we are developing world-class expertise and a workforce that can bring the latest knowledge to product and process innovations. Over the last five years, the federal government has taken giant strides toward building Canada's research infrastructure and funding our capacity to carry out research at the internationally competitive level.

Investing in the development of people is the crucial first step to knowledge creation and innovation. This involves faculty and graduate student support programs that allow universities to attract, develop and retain the best and the brightest.

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There is significant federal investment in university-based research in Ontario through the Canadian Foundation for Innovation, the granting councils—Natural Sciences and Engineering Research Council, Canadian Institutes for Health Research and Social Sciences and Humanities Research Council—and the National Centres of Excellence programs. Some of these investments leverage more than twice the federal investment through provincial matching and industry partnerships. Ontario universities are exceedingly grateful for this show of confidence in our potential, our commitment to the work of discovery and our dedication to success in delivering beneficial outcomes.

The people of Canada expect much from their generous support to research, and Canadian industry is relying more and more on universities to provide the expertise that they need to compete effectively in knowledge-driven markets.

Investments in research are doing a number of important things to create future prosperity in addition to the obvious contributions to knowledge:

- Government-funded basic research is developing Canada's knowledge workforce;
- Government-funded basic research is supporting the training of students who, upon entering industry, transfer their skills and knowledge to the private sector;
- Government-funded research is expanding the technological opportunities available to firms for developing new products and processes; and
- Government-funded research is supporting the creation of dynamic clusters of firms and the knowledge flows that are essential to effective innovation.

This volume illustrates how federal investment is advancing each of these key measures of success in building research capacity and delivering research results.

Dr. Kerry Rowe
Chair, Ontario Council on University Research

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Brock University
Careers begin here!

Multi-tasking and human safety: A passion for science and teaching

Dr. Karen Arnell

Dr. Karen Arnell of Brock University's Department of Psychology—a leading scientist in the area of human attention and processing limitations and an award-winning teacher—is one of three researchers who first discovered the attentional blink phenomenon. Her research program examines behavioural performance and neural activity while individuals react to multiple stimuli, and seeks to understand human attentional limitations in an era of multi-tasking.

Dr. Arnell argues that "despite our desire to do everything at once, there are finite limits on how much information we can attend to and process at any given time. As a result, attentional limitations may lead to the imminent failure of one or more tasks when they are performed in combination."

In professions such as air traffic control, individuals are bombarded with multiple stimuli. Funded by the Natural Sciences and Engineering Research Council and Canada Foundation for Innovation, Dr. Arnell's research seeks to understand why some tasks are easier to perform in combination than others, and how the mind and brain work when one is asked to attend to multiple tasks. She suggests that the most effective strategy in fostering successful multi-tasking involves modifying environmental stimuli. Performance deficits due to attentional difficulties may be avoided and human productivity increased through better selection of tasks for combination, by modifying one or more of the critical task requirements, or by modifying environmental stimuli.

While primarily theoretical, Dr. Arnell's research has practical applications. Health care professionals may apply knowledge gained from her research to the benefit of individuals who have attentional processing limitations such as those with depression or head injury.

Dr. Arnell's passion for science is matched only by her commitment to teaching and mentoring students. In addition to contributing to the research, she helps her students gain valuable experience in a laboratory setting and prepare for careers in cognitive neuropsychology or health care.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC) Discovery Grant	$22,000/annum
Canada Foundation for Innovation (CFI)	$98,156
Ontario Innovation Trust (OIT), Brock University and Industrial Partners	$147,234

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Brock University

Careers begin here!

Investigations into sample introduction techniques for analytical chemistry

Prof. Ian Brindle

Prof. Ian Brindle is interested in trace element analysis, particularly the detection and precise quantification of extremely small amounts of elements such as mercury and arsenic. Professor Brindle is committed to developing research that benefits society and the environment. His research and the creation, with his colleague Roger MacLaughlin, of new scientific instrumentation for measuring minute quantities of trace elements, underscore this commitment.

Professor Brindle's research program addresses the presence of arsenic in drinking water, a problem that plagues many developing countries including Bangladesh, Thailand and China. Chronic exposure to arsenic causes significant health problems and leads to reduced life expectancy; and in the developing world many do not have a choice but to consume contaminated water. Recently the World Health Organization recommended an arsenic standard of no greater than 10 parts per billion in drinking water, one that is 1/10 of the levels of arsenic found in well water in Bangladesh, and a very difficult standard to measure without highly sophisticated equipment. Drawing on his experience as an analytical chemist, Professor Brindle seeks to develop ecological systems to remove arsenic and other trace elements from drinking water as well as cost-effective instruments to measure water for the presence of these elements. In the former, Professor Brindle has focused his research on artificial, constructed wetlands that remove phosphorous from water. Since phosphorous shares characteristics with arsenic, he believes that constructed wetlands could help remove the toxic chemical from drinking water. His experience with sophisticated scientific equipment has led him to devise an inexpensive method for measuring trace amounts of chemicals in water. Combined, these strands of Professor Brindle's research hold great promise for remediating water issues and benefiting human health.

Professor Brindle and colleagues Drs. Andy Reynolds, Gary Pickering and Debra Inglis from the Cool Climate Oenology and Viticulture Institute (CCOVI) embarked on a project to identify key compounds specific to genuine icewines. By developing diagnostic tests to distinguish genuine Canadian icewines from faux counterparts, these researchers and their graduate students integrate their scientific expertise in the fields of viticulture, sensory perception, biotechnology and analytical chemistry to identify those physico-chemical changes that give Niagara's icewines their specific odour-active substances and unique aroma and taste. This research will contribute to the economic well-being of one of Ontario's and Canada's important export industries.

In 2002, in recognition of his achievements, Professor Brindle was awarded the Brock Chancellor's Chair for Research Excellence by the university.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	
—Discovery Grant	$84,000
—and (Co-investigator) Strategic Grant	$744,400

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Brock University
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Mobilizing research to benefit youth and community

The Youth Lifestyles Choice-Community Research Alliance (YLC-CURA) is a partnership between the Niagara Region's communities and schools and Brock University's research faculty and student research assistants (both graduate and undergraduate students). A long-term strategic partnership, the YLC-CURA seeks to conduct research to better understand the factors that foster healthy lifestyle choices in adolescence and into adulthood, and to identify gaps that may exist in services available to youth in the Niagara Region.

By examining factors that enhance resilience, research teams led by Dr. Teena Willoughby, university co-director, and Ms. Heather Chalmers, community co-director, focus on interventions that may minimize risk behaviours to a moderate level while protecting youth from adverse consequences. By promoting health—rather than limiting risk—the research teams investigate strategies and interventions that encourage positive lifestyle choices for youth.

These interdisciplinary teams are composed of 30 research faculty, students, and 35 not-for-profit organizations, local and regional agencies and schools. They collect biennial survey and focus group data to serve as a research base, and will continue to do so beyond the three-year phase of the grant to allow for refinement of insight into resilience and youth behaviour as well as school- and community-based interventions. Building on the foundational research base, the YLC-CURA teams will examine youth behaviour in different contexts.

The YLC-CURA training and intervention activities include integrating research into university and school curricula. These initiatives range from a Grade 11 *Self and Society Course*, student placements and professional development, to the development, evaluation and enhancement of program and policy interventions. One practical outcome from a survey of 167 youth programs was the development of a Directory of Youth Services in the Niagara Region.

These activities link the expertise, knowledge and resources of university researchers and students with the expertise, knowledge and resources of community partners. By linking university researchers with community agencies, program and policy interventions will be based on best practices. Through knowledge-sharing activities, the YLC-CURA communicates nationally with parents, youth and professionals, and networks internationally with other groups focusing on youth issues. These activities are essential to enact change and to have an impact on the health and well-being of youth (www.ylc-cura.ca).

Dr. Willoughby is supported by **Social Sciences and Humanities Research Council (SSHRC)** funding, the Canadian Language and Literacy Research Network, and a **Network of Centres of Excellence** funded through the **SSHRC, Natural Sciences and Engineering Research Council** and **Canadian Institutes for Health Research**. The YLC-CURA is the recipient of a three-year grant from SSHRC and in-kind and financial support from Brock University and its community partners.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC)	$600,000

CURA Working Group

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Brock University
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Intertextuality in children's literature

Dr. Sandra Beckett

Who's afraid of the big, bad wolf? Definitely not Dr. Sandra Beckett of Brock's Department of Modern Languages and Cultures, whose research focuses on how authors from around the world—in many cultures and many languages—have adapted this classic fairy tale to write stories that express cultural heritage and modern messages.

Charles Perrault's centuries' old story of Red Riding Hood is one of the best known and the most retold stories in the world. According to Dr. Beckett, a global expert on children's narratives and the intergenerational retelling of these stories, Red Riding Hood is "an icon for Western and non-Western civilizations." Dr. Beckett has expressed her astonishment at the number of interpretations that exist throughout the world. "For such a short story," she states, "authors have come up with so many retellings that relate to contemporary society."

For nearly a decade, Dr. Beckett has focused her research on the study of children's literature, and particularly on the international telling and retelling of these stories. She has traced the intercultural transmission of children's stories, and not solely from the Western canon to other cultural contexts. By studying the ways in which fairy tales are interpreted and re-interpreted as they move from culture to culture, Dr. Beckett is able to trace not only how tales of childhood inform and shape the cultural life of children in many different nations and cultures but also the ways in which these stories provide common experiences for children.

In addition to her current book, *Recycling Red Riding Hood*, published in the autumn of 2002, Dr. Beckett's scholarship will lead to two new books—*The Art of Recycling Stories in Children's Literature* and *The Art of Crosswriting Child and Adult*. In *The Art of Recycling*, Dr. Beckett examines the ways in which authors use motifs, characters and structures from fairy tales, fables and classics such as Alice in Wonderland, Pinocchio and Robinson Crusoe to write modern tales with contemporary messages, a process that is known as intertextuality. *The Art of Crosswriting Child and Adult* focuses on the trend in which authors write texts that appeal to both children and adults.

Dr. Beckett's scholarship, supported by the **Social Sciences and Humanities Research Council**, has led to international recognition. The Government of France awarded her l'Ordre des Palmes Academiques, its highest academic honour, for her work on Henri Bosco, and Brock University awarded her its Award for Distinguished Research and Creative Activity and the Chancellor's Chair for Research Excellence in 2001.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC)	$33,487

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Carleton
UNIVERSITY

NSERC Northern Research Chair

Dr. Christopher Burn

Northern Research Chair Dr. Christopher Burn has a 20-year record of research in the Canadian North and a strong record of co-operation with northern communities, educational institutions, and municipal, territorial and federal agencies.

Permafrost is prevalent throughout the North, and underlies over half of Canada. In vast tracts of our country, the permafrost is warmer than -2°C, and the prospect of climate warming implies widespread thawing of the ground. While climate change may lead to permafrost thaw over large areas, there are also localized effects due to forest fires and engineering construction. Yukon and Northwest Territories contain Canada's frontier oil and gas reserves, which are scheduled for production once pipelines have been built to the gas fields over the permafrost. Upon thawing, ice-rich permafrost loses strength, leading to subsidence, collapse and accelerated erosion. In the western Arctic, renewed industrial interest in hydrocarbons and the development of diamond mines are producing a demand for personnel specifically qualified in managing the use of and construction on permafrost terrain.

The Northern Research Chair will address the management of permafrost with the prospect of climate change and industrial development. A range of issues will be considered, from local monitoring of the impact of climate variability on the environment, to secure confinement of mine waste in permafrost. As Chair, Dr. Burn will also tackle the problems in partnership with local agencies, at the municipal and First Nations level, with the Territorial Government of Yukon, and with DIAND. Training of northerners will be in partnership with Yukon College, with permanent location of postdoctoral fellows in the North. Up to 10 graduate students will be supported to work in partnership with northern agencies, and to communicate their work to northern communities.

The Northern Research Chair will put in place a group of highly qualified personnel fluent in permafrost science and the conduct of research in Canada's North, and a cadre of northerners equipped to face challenges posed by both climate change and the rapid pace of industrial development, reinforcing Carleton's multidisciplinary presence in northern research.

FUNDING:	**VALUE:**
Natural Sciences and Engineering Research Council (NSERC)	**$1 million**

Carleton
UNIVERSITY

Canada Research Chair—
Criminology and Criminal Justice

Dr. Pat O'Malley, Canada Research Chair, Criminology and Criminal Justice

Many social problems—from health to crime to industrial or vehicle safety—are increasingly being managed and regulated from within a framework of risk. The use of statistical models to predict future problems has become a technique that we now take for granted. We live our lives increasingly in terms of statistically predicted risks: we engage in exercise and diet regimes statistically proven to lower our health risks; we buy all manner of vehicle "accessories" that statistically minimize injury risks; and predictive models are used to statistically reduce crime risks (e.g. racial profiling or profiling crime-vulnerable architecture or streetscapes). As the racial profiling example shows, however, such "risk-based" ways of governing can create new political, ethical and moral problems. We have thought little about the differing implications of using risk-based ways of dealing with problems. Indeed, research has mapped the spread of risk techniques but the enormous diversity of ways to manage problems by risk techniques remains a challenge.

We cannot have a general reaction to risk-based government because the techniques vary so much. Mass immunization differs greatly from racial profiling and both differ greatly from insurance—yet all deal with ways of "governing" problems through predictive, statistical models. This research program seeks to map the diversity of such techniques and their differing implications for how we live.

FUNDING:
Social Sciences and Humanities Research Council (SSHRC)

VALUE:
$1 million

Carleton
UNIVERSITY

Human-Computer Interaction Institute

The fourth phase of research into the field of Human-Computer Interaction (HCI) is now underway at Carleton University. This research began in 1978, when Dillon, Wood and Thorngate established the Computer User Research and Evaluation (CURE) group in the Department of Psychology. The second phase came in 2000 with the appointment of Dr. Gitte Lindgaard as the **Natural Sciences and Engineering Research Council** Research Chair in User-Centred Design. The third phase occurred in 2001 when researchers from other disciplines organized into a formal research unit. Today, Carleton is beginning the fourth phase with the construction of a building to house the laboratories of the HCI Institute. This new structure will provide the university, the local high technology community and Canada with a unique research and training facility that will foster interdisciplinary research, education and training to improve the design of interactive technology for human endeavours.

The revolutionary pace at which interactive technology evolves has brought with it a series of needs and research challenges, as well as opportunities no one would have thought possible as recently as five years ago. Computer systems now must be developed in "web time." Display surfaces are decreasing in size, forcing us to consider how to display information-rich files such as web pages on cell phone-sized equipment and wrist watches. Mobile, wireless technologies enabling people to carry their entire office with them demand ubiquitous access to schedules, office files and personal contacts by merging visual, auditory and voice-based interfaces.

HCI research focuses on people, trying to understand what they need, want, use and experience from interactive technology. The research will have an impact throughout Canadian IT industries as they adopt a user-centred design process. In turn, the research will impact the lives of millions of people who use equipment designed and produced by Canadian companies.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$1 million
Canada Foundation for Innovation (CFI)-Innovations Fund	$1,900,000
Canada Foundation for Innovation (CFI)-New Opportunities	$182,000

The Computer User Research and Evaluation (CURE) Group

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Carleton
UNIVERSITY

NSERC Industrial Research Chair—Fire Safety Engineering

Dr. George Hadjisophocleous

Carleton University has received funding from the **Natural Sciences and Engineering Research Council (NSERC)** and Forintek Canada, a national non-profit organization supported by industry and government to conduct research on wood products, to establish Canada's first Industrial Research Chair in Fire Safety Engineering. The Chair holder is Dr. George Hadjisophocleous, an internationally recognized expert in computer modelling of the fire-safety performance of buildings. His research program as Chair includes the development of computer models to predict the fire-safety performance of light-frame wood buildings, commonly used in new home construction in North America; and an investigation of occupant behaviour during fires, an important factor in determining the outcome of the fire.

The fire-protection community and the construction industry in Canada both require computer models and other design tools to ensure the fire-safety performance of buildings, including smoke management. Dr. Hadjisophocleous's research program includes full-scale testing using facilities at the National Research Council (NRC) and will build on Forintek Canada's expertise on the fire performance of wood-framed buildings. Canada is adopting a new system of "objective-based" building codes, and this research will help determine how light-frame buildings perform against the established objectives.

Dr. Hadjisophocleous will also be conducting research, in collaboration with Forintek Canada and the NRC, to determine occupant behaviour in emergencies. Contrary to popular opinion, people tend not to panic in emergency situations; new findings show that we are usually very rational when confronted with a fire incident.

In addition to the research program, the Chair will lead the development of a graduate program in Fire Safety Engineering at Carleton—the only graduate-level program of its kind in Canada.

Sponsored by **NSERC** and Forintek Canada, the Chair will receive additional in-kind support from Forintek through its research expertise, the Canadian Wood Council and Natural Resources Canada.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$600,000
Canada Foundation for Innovation (CFI)	$3,959,524

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UNIVERSITY of GUELPH

Researchers search for "key" to cancer puzzle

Carbohydrates are central to a research approach at the University of Guelph looking into a possible new therapy for cancer. At the core of this research, led by Dr. France-Isabelle Auzanneau in the Department of Chemistry and Biochemistry, is a carbohydrate research centre for modelling, creating and testing carbohydrate-based drugs to combat cancer. Funded by the **Canada Foundation for Innovation**, the new centre is working to develop a new addition to the arsenal of anti-cancer weapons: therapeutic vaccines to help the immune system identify and destroy cancerous tumours.

Distinct structures called carbohydrate epitopes are expressed on the surfaces of all cells, including cancer cells, and are involved in a variety of functions, including immune responses. Dr. Auzanneau and her research group are creating copies of these cancer cell epitopes and using them to stimulate the immune system to produce tumour-specific antibodies. These antibodies should then be able to attach to the epitopes on the surfaces of the tumour cells—much like a key fits into a lock—and mark them for destruction by the immune system.

The University of Guelph's carbohydrate research centre will consist of a computer modelling facility that will be used to design the carbohydrate-based drugs, an organic chemistry facility to synthesize them and a biochemical testing facility to test the antibodies produced by the immune response against their tumour cell targets.

Dr. Auzanneau's research has received additional support from Aventis Pasteur Ltd., the **Natural Sciences and Engineering Research Council**, the **Ontario Innovation Trust**, the Research Corporation and Signalgene.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$344,000
Ontario Innovation Trust (OIT)	$344,000
Aventis-Pasteur Ltd.	$91,000
Natural Sciences and Engineering Research Council (NSERC)	$403,000
The Research Corporation	$53,000
France-Canada Research Foundation	$10,000

Dr. France-Isabelle Auzanneau

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UNIVERSITY of GUELPH

What's behind the naturally occurring exchange of genetic material

A laboratory at the University of Guelph's Ontario Veterinary College is exploring a genetic process that is fundamental in all living organisms. Dr. Mark Baker of the Department of Pathobiology is studying the molecular mechanisms behind homologous recombination, the naturally occurring exchange of genetic material between the chromosomes of living cells. This recombination is a key process behind evolution and the generation of biodiversity, and it plays an important role in repairing DNA damage by preventing an accumulation of mutations that could cause cancer and other diseases.

The exchange of genetic information was traditionally believed to happen randomly along chromosomes, but Dr. Baker's research group, which is funded by operating grants from the **Canadian Institutes of Health Research**, has found evidence that some regions of the genome are more prone to recombination than others, and that animal cells exert control over the outcome of the recombination process. "Our goal is to understand the molecular basis by which mammalian cells regulate this elegant and important process," says Dr. Baker. This knowledge will lead to further understanding of the mechanisms of cancer and genome-destabilizing syndromes that confer increased susceptibility to cancer. It could also lead to advancements in gene therapy, human medicine and new applications in biotechnology.

Further support of this research is provided by the **Natural Sciences and Engineering Research Council.**

FUNDING:	VALUE:
Canadian Institutes for Health Research (CIHR)	$1,434,000
Medical Research Council (MRC)	$296,000
Natural Sciences and Engineering Research Council (NSERC)	$118,000

Dr. Mark Baker

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UNIVERSITY of GUELPH

Linking caffeine habit and diabetes

Canadians resolving to cut their caffeine intake may reduce certain health risks as well, especially if obesity and lack of exercise play a role in diets that are high in caffeine. Prof. Terry Graham, University of Guelph, Human Biology and Nutritional Sciences, is taking part in a three-year, tri-university effort researching the link between caffeine use and type-2 diabetes, the most common form of diabetes in Canada.

Startling statistics in Canada and the Western World have shown cases of type-2 diabetes are becoming increasingly common at younger age groups. While it was once described as maturity onset, it's now common among people in their 40s, and increasing obesity in children suggests it will continue to affect younger age groups.

Type-2 diabetes accounts for 90 percent of the diabetes in Canada. Those with the disease can still produce insulin—the body's blood glucose regulator—but Professor Graham says they can't produce enough to "get the job done," and they often have to take drugs to help manage blood sugar levels. For people already at risk, caffeine can have an unhealthy effect on insulin levels.

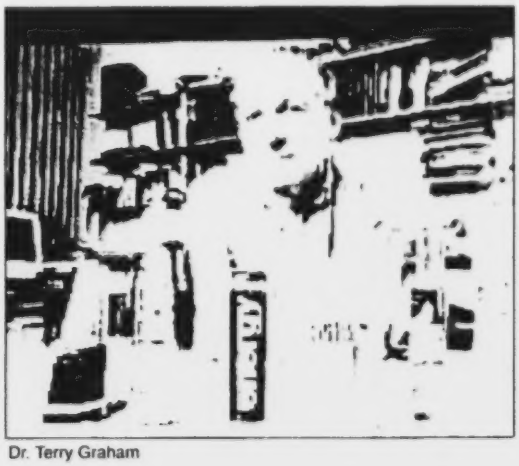
Professor Graham's concern is based on his previous studies involving caffeine's impact on exercise metabolism. Now, he's embarking on a new project that will study some long-term effects surrounding caffeine and type-2 diabetes. Among other long-term effects, the researchers will be looking for signs that the body adapts in habitual caffeine users.

"Caffeine is often thought of a benign drug," says Professor Graham, "and in many ways, it is. But from what we've seen so far, this research could lead to important potential treatment for diabetics."

Professor Graham's research, in addition to involving a number of graduate students, involves research teams at two other Canadian universities—Queen's University and the University of Waterloo.

This research is sponsored by the **Natural Sciences and Engineering Research Council.**

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$321,000



Dr. Terry Graham

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UNIVERSITY of GUELPH

Research with a jolt

From mineral refining and environmental remediation to inhibiting metal corrosion, electrochemistry—the study of the relationship between electricity and chemical reactions—is the unsung hero of everyday processes in industry, electrical technology, environmental protection and human health.

Recognizing the significance of this field and its wide range of applications, the University of Guelph, with financial support from the **Canada Foundation for Innovation** and the **Ontario Innovation Trust**, has established the interdisciplinary Electrochemical Technology Centre (ETC), which will serve as the vehicle for national and international collaboration with government, research institutes, industry partners and other universities.

Spearheaded by Prof. Nigel Bunce of the Department of Chemistry and Biochemistry, the ETC already features complementary research in areas as diverse as metallurgy, sensors for the detection of hazardous substances and waste treatment.

Working with industry

"Electrochemical technology is at the crossroads of many disciplines," says Prof. Jacek Lipkowski, Department of Chemistry and Biochemistry. "Brain and nerve functions, circuits, industrial processes like electroplating and electrorefining, environmentally friendly technologies like the fuel cell—all of these areas of study are based on electrochemistry, and in order to develop them we must develop electrochemical research."

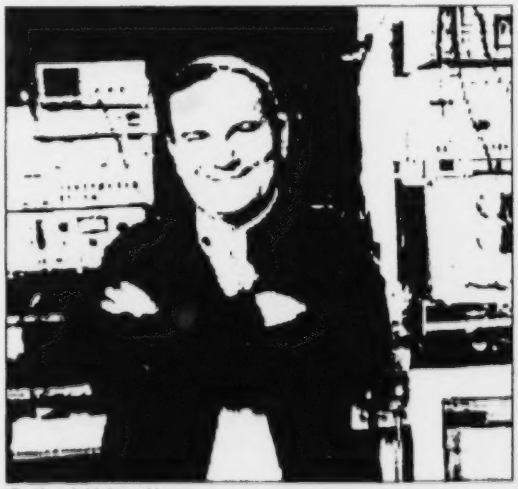
Professor Lipkowski will have the opportunity to do that, working with industrial partners such as INCO, Ontario Power Generation and Atomic Energy of Canada Limited. His recent appointment to the **Canada Research Chair** in Electrochemistry will allow him to expand on his current research collaborations with Acadia University, McMaster University and Université de Sherbrooke. One of his research initiatives focuses on the prevention of corrosion, a problem costing the automotive industry $500 billion annually. It's a big problem that affects everything from bridges to households—and of course, cars and trucks.

Professor Lipkowski and his research team are looking at how certain organic compounds smooth out metal coatings during the process of electroplating, which inhibits the corrosion process. By examining the mechanism of electroplating and electrorefining at the molecular and atomic levels, Professor Lipkowski hopes to provide a sound scientific basis of understanding for the electrometallurgic industry, which is worth $5 billion a year in Canada alone.

Digging deep for answers to mining problems

Electrochemistry may also provide solutions for cleaning up acid mine drainage (AMD), in which wastes from ore mining are leached into ground and surface water, leading to the acidification of downstream water as well as the release of toxic elements (including cadmium, lead and arsenic) from natural minerals—a double whammy of pollution that can devastate aquatic life.

Centre leader Bunce's strategy to mitigate damage by AMD is to raise the pH of the mine effluent by an electrochemical technique called electrolysis, and then to bubble air through the treated water, causing precipitation of iron (a major component of AMD)



Dr. Jacek Lipkowski

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along with some of the other metals, out of the water. Along with his research group, Professor Bunce has developed a workable method in the laboratory, and applied it on a test scale to AMD from one of the spent nickel mines in Sudbury. His main objective is to make the treated waters hospitable for aquatic life.

"Electrochemical reactions are 'green' in that they don't involve using chemicals to clear away other harmful chemicals," says Professor Bunce. "They only use electricity, so it's only natural that they should be applied to environmental remediation."

Drinking water: a current event

Issues of water pollution are also vital in the arena of human health, especially in Canada's post-Walkerton, post-North Battleford climate. But new technologies being explored at the ETC may offer a rapid, efficient method of determining the quality of drinking water.

Prof. Abdelaziz Houmam, Department of Chemistry and Biochemistry, is leading studies into the development of new biosensors, devices that use electrochemical reactions to accurately measure concentrations of biological and organic compounds. Specifically, Professor Houmam and his colleagues—from the University of Guelph, University of Toronto at Mississauga and Université de Rennes and Université de Lyon in France—are examining a rapid biosensor for E. coli bacteria that can be used to determine how many bacteria are present in a water sample—and whether or not the water is safe to drink.

The electrochemical processes in biosensors do not produce any harmful chemical wastes, and permit highly sensitive detection. Biosensors can be inexpensive and portable, making fast, on-site analysis in numerous different locations possible. Environmental analysis for pollutants and food-safety testing are among the many applications Professor Houmam sees in the future of electrochemical biosensors.

"Electrochemical devices and reactions are very multidisciplinary in nature, and the ETC is a great opportunity for bringing together talent from different fields and institutions," says Professor Houmam. "The expertise gathered at the ETC benefits not only the university, but also its collaborators, its students and society."

FUNDING:	VALUE:
Nigel Bunce	
Canada Foundation for Innovation (CFI)	$1,213,000
Ontario Innovation Trust (OIT)	$1,213,000
Natural Sciences and Engineering Research Council (NSERC)	$172,000
The EJLB Foundation	$66,000
Abdelaziz Houmam	
Canada Foundation for Innovation (CFI)	$239,000
Ontario Innovation Trust (OIT)	$239,000
Natural Sciences and Engineering Research Council (NSERC)	$38,000
Jacek Lipkowski	
Canada Research Chair, Tier 1 Electrochemistry	$681,000
Canada Foundation for Innovation (CFI)	$140,000
Ontario Innovation Trust (OIT)	$140,000
Natural Sciences and Engineering Research Council (NSERC)	$681,000

UNIVERSITY of GUELPH

Landmark periodical devoted to children's literature

The University of Guelph is home to Canada's only academic periodical devoted to the Canadian component of children's literature.

This year, Prof. Daniel Chouinard and his colleagues at the University of Guelph celebrated the printing of the 100th issue of *Canadian Children's Literature* (CCL), which was launched in 1975 with the university's acquisition of documents belonging to *Anne of Green Gables*' author Lucy Maud Montgomery. The University of Guelph's mandate was to make Canadian children's literature known around the world.

CCL's editors dedicate each issue to a chosen theme. Like adult literary researchers, CCL researchers write full-length research articles that put classic and contemporary children's tales and their authors into context, in relation to contemporary issues and debates. Articles will relate certain tales or genres to popular culture or to varying perspectives such as feminism, post-colonialism or post-modernism. Special issues in the past have argued the relationship of children's literature to censorship and even the Holocaust. Many people mistakenly believe children's literature is exempted from such heavy issues, Professor Chouinard says.

Professor Chouinard sees children's literature as a powerful educational tool. He says research in the genre is extremely multifaceted because it utilizes sociology, psychology, education and history. It's also international—while the publication focuses mainly on literature within Canada, it boasts subscribers and contributors in countries all over the world, including Holland, France, Poland and Bulgaria.

Funding for the periodical has been provided by the **Social Sciences and Humanities Research Council**.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC)	$33,000

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Lakehead
UNIVERSITY

Lakehead researcher taking care of Ontario's precious resources

Dr. Ellie Prepas

Dr. Ellie Prepas, **Canada Research Chair** in Sustainable Water Management and the Boreal Forest at Lakehead University, is working to clean our water. Dr. Prepas, who has a background that includes 20 years of experience in water, soils, landscape models and policy development, is a recognized expert on cyanobacterial toxins, one of the biggest concerns in fresh water lake quality.

Cyanobacteria are recognized as problem "algae" in water and, along with imparting bad tastes and odors to water, they also produce toxic chemicals called biotoxins. Dr. Prepas's research focus is on the collection and organization of an appropriate database on fresh water in the Boreal Forest and the development of tools to link those data with current modelling efforts for sustainable landscape or watershed management. Dr. Prepas's expertise on the Boreal Plain will be built upon and linked with a new project to be developed in the Lake Superior watershed on the Boreal Shield. Together with the university community, the private sector and government, Dr. Prepas is working to develop strong linkages between surface water quality, bioindicators and spatially based landscape-management models.

As Canada Research Chair, Dr. Prepas is training Lakehead students in northwestern Ontario in an environment where watershed management is integrated with landscape and forest planning. Because her students are trained in an environment where they work closely with both the private and public sectors, they have had a strong record of employment and leadership in the field. Nationally and internationally, the private sector is in need of highly trained people who can solve environmental challenges.

The program will see benefits with the training of graduate students in the techniques and linkages between land and water for Northern Ontario. The modelling approach to be used will be integrated into a forest company's detailed forest-management plans over the next five years. The forest industry will be under increasing pressure provincially, nationally and internationally to show that it has incorporated environmental concerns into its planning and forest operations. Currently the tools or data to make those linkages necessary between land and surface water management are not available.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$354,189
Natural Sciences and Engineering Research Council (NSERC)	$2,326,545
NSERC/SSHRC Sustainable Forest Management	$180,000
Canada Research Chair (Tier 1)	$1.4 million over 7 years

Lakehead
UNIVERSITY

Scanning Electron Microscope to help further the understanding of diamond deposits

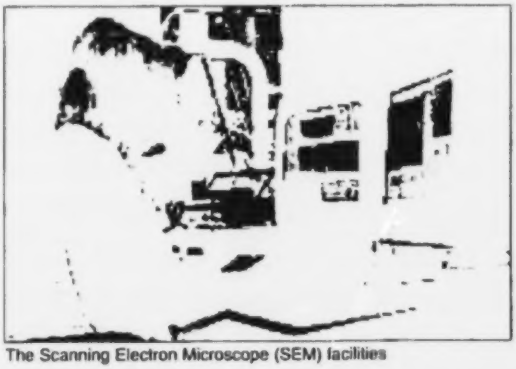
The Scanning Electron Microscope (SEM) facilities at Lakehead University are used by a variety of departments including Anthropology, Biology, Chemistry, Engineering, Forestry, Geology and Physics. The microscope is an important aid in solving industrial analytical problems because it can examine the microstructure and surface characteristics of many biological and inorganic materials, including the elemental composition of areas as small as a few microns.

Major users of the SEM are Dr. Roger Mitchell and his graduate students whose research interests focus on the mineralogy and petrology of kimberlites and alkaline rocks. This work is concerned with the recognition and description of ore deposits—diamond, rare earth element, and strategic metal (niobium, tantalum, zirconium, platinum and palladium)—and has applications to radioactive waste disposal and solid state/ceramic industrial materials.

One aspect of Dr. Mitchell's research concerns the rocks that host diamond deposits. An increased understanding of the mineralogy and petrology of the diamond-bearing volcaniclastic kimberlites of Canada, coupled with new data on the petrology of crater facies kimberlites from southern Africa, will lead to revised models of kimberlite emplacement and eruption. These models are essential in understanding the genesis of diamond deposits.

Dr. Mitchell is a Fellow of the Royal Society of Canada. In recognition of his research, he is also a recipient of the Past President's Medal of the Mineralogical Association of Canada.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$148,559
Ontario Research and Development Challenge Fund (ORDCF)	$148,559
Other Partners	$74,280
Natural Sciences and Engineering Research Council (NSERC) Equipment Grant (2002)	$16,105
Natural Sciences and Engineering Research Council (NSERC) Research Grant (2002-2007)	$437,800



The Scanning Electron Microscope (SEM) facilities

Lakehead
UNIVERSITY

In search of an "intelligent" robotic system

When Abdelhamid Tayebi drives to Lakehead University in the morning, he's thinking about control. As a professor in Lakehead's Department of Electrical Engineering, control means something a little different to Dr. Tayebi than it does to the general population. Control in electrical engineering terms is the device that manages a system. Your brain, for example, is the control for the system of your body.

"When you drive to work in the morning," Dr. Tayebi says, "your brain is a control mechanism, responding to input from your eyes, and then making your hands and feet respond accordingly."

Dr. Tayebi's main areas of research are in nonlinear control theory, adaptive control, robust control and iterative learning control (ILC)—a relatively recent development in a more than 100-year-long history of control theories.

"ILC allows robotic systems to be more 'intelligent'; in the sense that robots can learn from their mistakes to avoid them and perform better in the future. For instance, a robot operating repeatedly under the same control input will produce the same tracking error over and over again. The main idea behind ILC techniques is to take advantage of the previous operations in order to adjust the control input to be applied to the system in the upcoming operations. In fact, the longer the robot performs the task, the smaller the margin of error will be."

So far, Dr. Tayebi has designed and tested ILC algorithms only in simulation, not in real time. That will change thanks to his recent award from the **Canada Foundation for Innovation**, which in turn has been matched by the **Ontario Innovation Trust** and generously supplemented by other corporate partners. This funding will go toward equipping the Automatic Control Laboratory and will have a significant impact on the research capabilities at Lakehead and the training of highly qualified professionals in control engineering.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$200,034
Ontario Innovation Trust (OIT)	$200,034
Other Partners	$151,283

Dr. Abdelhamid Tayebi

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Lakehead
UNIVERSITY

Learning from women survivors of hemorrhagic stroke

Dr. Sharon Dale Stone

Dr. Sharon Dale Stone, with Lakehead's Department of Sociology, recently received a **Social Sciences and Humanities Research Council** grant for her research, Women Survivors of Hemorrhagic Stroke: Experiences of Living with Invisible Disabilities.

"There is not much known of the experiences of these survivors—especially of women survivors of hemorrhagic stroke," Dr. Stone says. Her research will assist people affected by these experiences, either as survivors, as people who live with them, or as people who work in some manner with survivors.

Dr. Stone's research will develop an understanding of women's experience of living with disabilities that are neither readily apparent to others, nor subject to ongoing medical attention; develop recognition of stroke as a common experience for women of all ages, not just the elderly; and offer a contribution toward the articulation of linkages between the fields of the Sociology of Health and Illness, Disability Studies and Women's Studies.

Generally, researchers in the Sociology of Health and Illness take the individual out of her or his social context to understand how one's sense of self is affected by having a chronic illness. Individuals are variously conceptualized as "patients" or "sufferers" as though this status is the single most important feature of their lives. This research shows little awareness of the difference between living with chronic illness and living with disability. To a large extent, these conceptualizations stem from dependence on a medical definition of the situation.

Dr. Stone's research will reject a medical definition of the situation. Instead it will draw upon theory generated within the field of Disability Studies, which distinguishes between chronic illness and disability, and places the experience of living with disabilities within a wider social context. She will also draw upon theories from the field of Women's Studies, which recognize that experience is necessarily mediated by social location and context, and that attention needs to be paid to such factors as gender, race, class, age or sexual identity.

The experience of living with invisible disabilities and the experience of women (as opposed to the more typical focus on men's experiences) will be highlighted throughout Dr. Stone's research. She will conduct multiple, in-depth and open-ended interviews with 20 to 30 women who are survivors of hemorrhagic stroke before the age of 50. Approximately 1 to 5 percent of the population experiences a hemorrhagic stroke, and it is often fatal. Those who survive are typically left with invisible disabilities such as hemiplegia, aphasia, and pronounced susceptibility to fatigue, which significantly impacts on daily life.

Dr. Stone's focus on relatively young women will counter the usual assumption that stroke is an unusual occurrence before old age. Her research will advance knowledge about the experiences of relatively young women who have survived hemorrhagic stoke.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC)	$77,825

Laurentian
Laurentienne

Radiochemical and environmental sample analysis facility

Dr. François Caron

The production of radioactive wastes is generally perceived as one of the major problems facing the nuclear industry. Although radioactivity is a natural phenomenon (there are uranium deposits in nature), past activities in nuclear research centers, mining activities (tailings) and the current use of nuclear energy have all contributed to increase the levels of radioactive elements in our environment. Past, present and future waste generation has to be managed responsibly, through remediation, and proper waste handling (storage or disposal). In all cases, the philosophy of any type of waste management is to minimize and control the quantities of radioactive substances that would migrate to the environment. Since it is not possible to fully isolate waste, we have to make sure that migration of radioactivity is low and that wastes are isolated from the environment for as long as feasibly possible. Dr. François Caron's overall research strategy is to understand the behaviour of radioactive elements in nature and to apply this data to predict the movement of these elements in the environment.

Geochemical data are needed to calculate the migration of radioactive elements between a source of contamination and a point of impact. These calculations rely largely on geochemical data that are often inexistent for some radioactive elements or that are incomplete. Dr. Caron's work takes into consideration conditions such as the environment, the major ions (including dissolved organics) and the matrix of the waste source because in most cases the radioactive elements are largely outnumbered by major elements, on a mole or an atom basis. Funding from the **Canada Foundation for Innovation**, the **Ontario Innovation Trust**, the **Natural Sciences and Engineering Research Council** and **Materials and Manufacturing Ontario** helped to equip the facility for Dr. Caron's research. This includes the purchase of gamma spectroscopy equipment and a basic instrument for the analysis of major ions and dissolved organic carbon (HPLC, titrator, carbon analyzers). The heart of the system is a custom-designed water purification system, which provides an uninterrupted supply of ultra-pure water, necessary for the analysis of trace amounts of dissolved organic carbon, at the low ppb level.

Dr. Caron has more than 14 years of working experience with radioactivity. This expertise includes the behaviour of Carbon-14, from reactors to waste management areas, and to contaminated air and groundwater, as well as the speciation of other radionuclides and other aspects of radiochemistry in contaminated areas.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$55,000
Ontario Innovation Trust (OIT)	$55,000
Materials and Manufacturing Ontario (MMO)	$25,000
Natural Sciences and Engineering Research Council (NSERC)	$40,000

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Laurentienne

Rhetorical analysis of midwifery regulation

As a recently regulated health care profession in Ontario, midwifery is subject to new forms of standardization and professionalization that have created both challenges and opportunities. Incorporating this traditionally alternative, grassroots form of women's health care into the mainstream health care system has generated a variety of tensions related to the practice, knowledge, identity and relationships of the newly regulated profession of midwifery. To examine and understand these tensions more deeply, Dr. Philippa Spoel (principal investigator) and co-investigators Dr. Susan James and Dr. Catherine Schryer are conducting a three-year interdisciplinary project entitled The Textual Formation of a Health Care Profession: A Rhetorical Analysis of the Regulatory Documents Governing Ontario's Midwifery Profession.

This study focuses on the language of midwifery's regulatory documents and the role it plays in shaping this emerging profession. By using rhetorical and discourse theory to analyze the set of regulatory documents produced by the College of Midwives of Ontario, this research contributes a unique perspective on the uneasy process of midwifery professionalization. In particular, it will show how the language of the regulatory texts both shapes and limits the kinds of knowledge, practice, identities and relationships within the profession of midwifery. As well, it will offer a new perspective for understanding the complex social and political circumstances surrounding the professionalization of midwifery in Ontario. This rhetorical analysis of the midwifery profession may provide a useful model for analyzing the regulation of other health care professions.

FUNDING: **VALUE:**
Social Sciences and Humanities Research Council (SSHRC) **$57, 000**

Dr. Philippa Spoel
Associate Professor, Department of English
Laurentian University

Other members of the research team are:
Dr. Susan James
Director, Midwifery Education Program
Laurentian University
and
Dr. Catherine Schryer
Associate Professor, Department of English
University of Waterloo

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Taking research to heart

Dr. Sonia Anand

What are the determinants of vascular disease for women? Why do native peoples and Canadians from certain ethnic groups suffer more heart attacks and strokes than others? Trying to find the answers to these questions has led to new directions in heart disease research for Dr. Sonia Anand, assistant professor of medicine in McMaster's Faculty of Health Sciences.

Described as a rising star in international cardiovascular research, Dr. Anand has taken a lead role in the investigation of heart disease in women and various ethnic groups, including Canadians of South Asian origin and Aboriginal Peoples.

Dr. Anand's study of subjects from three ethnic groups in Canada resulted in findings that may change the way medicine assesses heart disease risk in ethnic populations. Her study showed that the way we understand heart disease, heart attacks and strokes is not the same for every population—perhaps because most of the larger studies have been done predominantly on Caucasians.

Her health assessment and risk evaluation of Aboriginal Peoples, funded by the **Canadian Institutes of Health Research (CIHR)** Institute of Aboriginal Peoples Health, found that Six Nations residents were two to three times more likely to suffer heart attacks and strokes than the general population. Hers was the first study to show a direct link between low income and heart disease in native people.

Recently appointed to the Eli Lilly Canada-May Cohen Chair in Women's Health, Dr. Anand will develop policy recommendations from research findings and educate both the public and health care professionals on women's health, especially on modifying risk factors for cardiovascular disease.

A recipient of the **CIHR** Clinician Scientist Award (1998), Dr. Anand's research career has already changed the landscape of population-based epidemiology and cardiovascular medicine.

FUNDING:	VALUE:
Canadian Institutes for Health Research (CIHR)	$3.45 million

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Environment and health—fishing for answers

There are strong links between the industrial use of metals and environmental pollution. Fish have exhibited adverse reactions to these pollutants, prompting the creation of tough international regulations. But some have crippled industry. Can a balance be found to protect the environment, while still permitting the use of metals that are beneficial to society? McMaster biologist and **Canada Research Chair** in Environment and Health, Dr. Christopher Wood, has spent the last 25 years fishing for the answer.

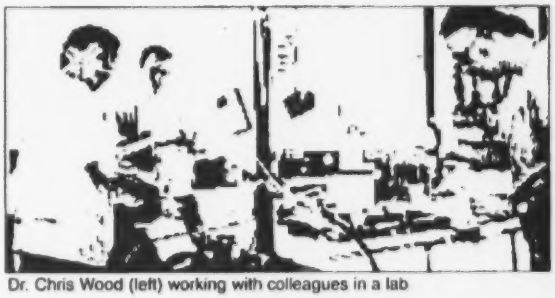
As one of the world's foremost experts in fish physiology, Dr. Wood has conducted field studies from China to Brazil. He has discovered that fish are surprisingly resilient in adapting to changes in their environment. His laboratory studies have uncovered new knowledge about the most important organ in a fish—its gills. At one time, the gills of a fish were thought to act only as the lungs. Research has shown that the gills combine the functions of a human kidney and digestive tract. How metals pass through or are absorbed by the gills is at the heart of Dr. Wood's research.

Dr. Wood has conducted pioneering research into the effects of acid water and aluminum on the gills of fish. He was the first to identify cardiovascular collapse as the final cause of death in fish living in highly acidic waters. The finding is highly significant in understanding the global problem of acid rain.

He also has played a pivotal role in developing scientifically sound environmental regulations governing the use of metals. In 1998, his research on the aquatic toxicology of silver prevented a European-led proposal to have photographic film labeled as hazardous waste. In this case, it was proven that the industry's byproduct had a negligible effect on the health of fish.

Last year, Dr. Wood, along with McMaster colleagues Dr. James Kramer and Dr. Russell Bell, and researchers from the Université du Québec and Wilfred Laurier University, won a **Natural Sciences and Engineering Research Council**/Conference Board of Canada Synergy Award for their work with industry partner Kodak. Kodak turned to this group—considered to be among the world's best—to ensure the criteria used to set the water-quality guidelines for silver were as accurate and useful as possible.

FUNDING:	VALUE:
Canada Research Chair	$1.4 million
Natural Sciences and Engineering Research Council (NSERC)	$750,000



Dr. Chris Wood (left) working with colleagues in a lab

Globalization and autonomy

"Who would have thought 10 years ago that a small Canadian business or a Mexican peasant would require knowledge of NAFTA trading rules or World Trade Organization subsidy definitions to earn a living?" asks Dr. William Coleman, McMaster political sciences professor and **Canada Research Chair** in Global Governance and Public Policy.

"We are living in an increasingly complex global village, and our research findings will help Canadians negotiate the changes ahead," he says of a new $5-million international research project examining globalization and autonomy.

Dr. Coleman was awarded funding from the **Social Sciences and Humanities Research Council (SSHRC)** for the five-year project that involves 13 Canadian universities and 16 international organizations, including experts from China, Taiwan, Europe and the U.S. The other funding comes from partnering universities, primarily McMaster University and the University of Toronto.

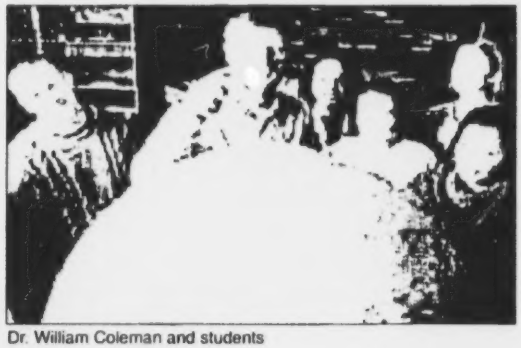
Findings from this study will help guide policy-makers and scholars in dealing with questions such as: Do the World Trade Organization and the G-8 or G-20 summits destabilize national governments by shifting policy making to the international level? Does globalization marginalize developing countries? Is globalization reducing cultural diversity? Is globalization increasing the possibilities for creating high-technology industries in developing countries? Do international human rights agreements help marginalized groups?

Eighteen McMaster researchers will be among the 56 scholars bringing expertise to the project from their disciplines in history, sociology, anthropology, political sciences, literary studies and cultural studies.

Along with its intended impact on global policies, Coleman says the study will have many benefits for students, estimating that the SSHRC funding will provide approximately 120 student-years of training, enhancing the development of students' research skills.

When the study is completed, Dr. Coleman and his research team will have produced seven books, all of which will be translated into Chinese, and will have created a multimedia compendium on globalization that will make their findings available to the general public, both in CD-Rom format and on the Internet.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC)	$2.5 million
Canada Research Chair	$1.4 million



Dr. William Coleman and students

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Text-analysis portal for research

Dr. Geoffrey Rockwell

Opening soon at a computer near you: a Text-Analysis Portal for Research (TAPoR). Based at McMaster and co-ordinated by Dr. Geoffrey Rockwell, director of the Humanities Computing Centre, the $6.8 million TAPoR project represents the first major proposal in Canada to exploit the web as an intelligent medium for text.

Web pages, e-mail messages and digitally formatted documents are all examples of electronic text (e-text). For most people, e-text is something that is written, retrieved and read. For researchers in the humanities, e-text represents a world of new opportunity to study and analyze the meaning, form and use of language.

TAPoR will build a human and computing infrastructure for text analysis across the country by bringing together many of the significant centers of humanities computing across Canada. The TAPoR network consists of McMaster, the University of Victoria (in collaboration with Malaspina University College), the University of Toronto, the University of Montreal (law) and the University of New Brunswick.

Researchers at McMaster will be involved in the following TAPoR projects:

- Digitizing approximately 40,000 letters in the Russell Archive, for McMaster's world-renowned Bertrand Russell Research Centre (Dr. Nicholas Griffin);
- Creating a database of information about musical performances in Hamilton from 1846 to 1896 (Dr. Fred Hall, Dr. Geoffrey Rockwell);
- Developing multimedia research works in French and multimedia, combining streaming audio and video with textual documentation into hypertexts (Dr. Alexandre Sévigny, Dr. Madeleine Jeay, Dr. Andrew Mactavish, Dr. Geoffrey Rockwell);
- Developing text-analysis tools such as TACTWeb and visualization tools, supported by TAPoR infrastructure that can be scaled out for general use (Dr. Geoffrey Rockwell); and
- Developing an Electronic Encyclopedia of Globalization (Dr. William Coleman, Dr. Andrew Mactavish, Dr. Geoffrey Rockwell).

The undertaking is the largest ever of its kind in Canada and among the largest in the world. The **Canada Foundation for Innovation** grant of $2,629,223 represents the largest grant ever given to a humanities project in Canada.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$2.6 million

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NIPISSING

Profiles of research success

Dr. David Hall

Sociology professor, Dr. David Hall, with co-investigator Dr. Rod Beaujot of the University of Western Ontario, is looking at the ways familial relationships provide us with social and emotional support but can also engender considerable anxiety and risk. The research focus is on assessing the strength of a relationship by examining the levels of interpersonal risk and anxiety that couples experience, and the number of children they intend to have. For their research, entitled Gender, Interpersonal Risk and Childbearing, Dr. Hall and Dr. Beaujot were awarded a three-year **Social Sciences and Humanities Research Council** grant. The products of their research may have an impact on the development of policies and support systems for families and children in the face of minimal population growth in Canada.

FUNDING:
Social Sciences and Humanities Research Council (SSHRC)

VALUE:
$62,300 over 3 years

Dr. John Kovacs

Dr. John Kovacs of Nipissing University's Geography Department is studying the environmental impact of wetland change on the mangrove forests along Mexico's Pacific coast. He was awarded a four-year **Natural Sciences and Engineering Research Council** grant to pursue research entitled Alternative Methods for Assessing and Monitoring Mangrove Forests. Dr. Kovacs's interdisciplinary work involves mixing new techniques, such as monitoring satellite imagery, with community-based participatory research to collect and engage indigenous knowledge. The research outcomes may have impacts on land-use planning, environmental health, coastal-zone sustainability and community sustainability.

FUNDING:
Natural Sciences and Engineering Research Council (NSERC)

VALUE:
$15,000 per year for 4 years

Dr. Lorraine Janzen

Victorian Poetry and Illustration is the research focus of English professor Lorraine Janzen. Dr. Janzen's three-year **Social Sciences and Humanities Research Council** grant enables her to pursue research that will contribute to the knowledge of Victorian visual culture, and to the fields of Victorian studies and publishing history. Some of the knowledge gleaned through Dr. Janzen's research will provide material for her forthcoming book, *Christina Rossetti and Illustration: A Publishing History*.

FUNDING:
Social Sciences and Humanities Research Council (SSHRC)

VALUE:
$38,836 over 3 years

(continued)

Dr. Dana Murphy

Dr. Dana Murphy of Nipissing University's Psychology Department and head of the Northern Centre for Research on Aging and Communication is researching how older adults hear and process language and the impact of cognitive changes on hearing. Dr. Murphy's work, Spoken Language Processing Among Adults and Contributions of Cognitive and Auditory Factors, looks at how hearing loss affects speech and language comprehension and examines the corollary affect on learning. Dr. Murphy was awarded a **Natural Sciences and Engineering Research Council** equipment grant, as well as a four-year operating grant. Using a soundproof booth, Dr. Murphy tests the hearing of volunteers in two groups, age 17 to 29 and older than 60. He presents visual and auditory information to them to observe how their hearing affects cognition. The possible outcomes of his research include a better understanding of the aging process and improvements in products aimed at helping older adults hear better.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$15,037 per year for 4 years
NSERC Equipment Grant	$24,750

Dr. Andrew Weeks

Dr. Andrew Weeks, Psychology professor, is studying brain structures in learning and memory by examining changes in synapses after learning occurs. Entitled An Examination of Synaptic Ultrastructural Change Following Learning and Neural Activation, Dr. Weeks' research garnered a four-year **Natural Sciences and Engineering Research Council** grant. Combining psychology and neuroscience, his research will help provide a better understanding of the brain and how it handles learning. Possible applications for this research include advances in understanding degenerative diseases, such as Alzheimer's and Parkinson's.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$88,000 over 4 years

Dr. Murat Tuncali

Topologist Dr. Murat Tuncali is in the third year of a four-year **Natural Sciences and Engineering Research Council** grant. Dr. Tuncali's research involves a variety of problems arising out of Continuum Theory and Topological Dynamics. One facet of his research deals with the question of what topological spaces admit expansive homeomorphisms. Expansive homeomorphisms form an important class of mappings that exhibit chaotic behaviour. Another facet deals with problems concerning indecomposable continua. Many of the strange attractors studied in dynamical systems are indecomposable continua. These two strands of research relate to the study of dynamical systems and chaos theory.

Dr. Tuncali's research also involves the study of non-metric continua, in which the distance between a pair of points cannot be measured. This study, in general, involves investigating the relation between the general structure of such continua and the properties of its certain subsets, and it involves some outstanding set-theoretic problems concerning perfectly normal compact spaces.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$36,000 over 4 years

Université d' University of Ottawa

Synaptic plasticity and gene expression at the neuromuscular junction

Communication between nerve cells in the brain occurs through specialized structures known as synapses. In recent years, there has been a major scientific effort to decipher the mechanisms involved in the assembly, maintenance and plasticity of synapses. Because of its relative simplicity, as compared to synapses in the brain and accessibility in the peripheral nervous system, the neuromuscular junction—the site of contact between nerve and muscle—represents an excellent model to study these events at the molecular, cellular and physiological levels.

Prof. Bernard Jasmin is interested in the molecular and cellular mechanisms governing the regulation of synaptic proteins at the mammalian neuromuscular junction. His long-term objectives are to identify key regulatory mechanisms underlying the accumulation of a specific set of proteins within the postsynaptic membrane domain of the neuromuscular junction, and to define how interactions between nerve and muscle result in the modulation of physiological functions through a series of complex cellular and molecular events.

The results of these studies will contribute to our knowledge of synaptic protein regulation in both muscle and nerve, and the pathophysiology of several neurological and neuromuscular disorders and conditions.

FUNDING:	VALUE:
Canadian Institutes of Health Research (CIHR)	$1,115,049
Premier's Research Excellence Awards (PREA)	$150,000

First row, left to right: Kambiz Mousavi (PhD Student); Bernard Jasmin (Professor); Mark Stocksley (Postdoctoral Fellow); Melissa Jones (Postdoctoral Fellow); Julie Deschenes-Furry (PhD Student); Flora Nasrallah (Summer Student).

Second row, left to right: Louis Martineau (Postdoctoral Fellow); Jennifer Thompson (MSc Student); Guy Belanger (Postdoctoral Fellow); Joe Chakkalakal (PhD Student); John Lunde (Research Associate).

Not shown: Lindsay Angus (PhD Student); Loren Smith (MSc Student); Sophie Marchand (Postdoctoral Fellow).

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Université d' / University of
Ottawa

Materials and molecules for the 21st century

New drugs free from harmful side-effects, lightweight plastics tougher than steel and photonic materials for the all-plastic computer have a single enabling technology in common. All are the products of highly selective molecular engines, termed catalysts, that assemble simple building blocks into complex, highly organized molecules. Prof. Deryn Fogg's research lab at the University of Ottawa is unravelling the chemistry that will permit design of "immortal" catalysts that integrate robustness, precision and versatility. Such catalysts confer unprecedented power and efficiency in construction of both small molecules and polymer materials.

Recent accomplishments include the development of methods for manipulation of the active site, permitting toggling of catalyst behaviour between different modes. This technology presents an unprecedentedly efficient route to industrially valuable, optically clear plastics. Other work has identified and resolved major catalyst deactivation pathways, and opened up new concepts in catalyst design.

Funding from the **Canada Foundation for Innovation** and **Natural Sciences and Engineering Research Council (NSERC)**, as well as provincial sources (**Ontario Innovation Trust**), has built a state-of-the-art facility in the Fogg group, supporting catalyst design, application and innovative characterization methods. Groundbreaking research is carried out in collaboration with highly qualified graduate student and postdoctoral personnel, supported by NSERC and **Premier's Research Excellence Awards** funds. Major additional infrastructure is provided through the **Canada Foundation for Innovation**-funded Center for Catalysis Innovation and Research (of which Professor Fogg is a founding member).

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)-Innovation Fund/Ontario Innovation Trust (OIT)	$1,559,094
Natural Sciences and Engineering Research Council (NSERC)	$214,320
Premier's Research Excellence Awards (PREA)	$150,000
Canada Foundation for Innovation (CFI)-New Opportunities/Ontario Innovation Trust (OIT)	$906,315

Prof. Deryn Fogg

Université d'
University of
Ottawa

Shattering stereotypes about vernacular languages

Prof. Shana Poplack

Diversity resides not only in multiculturalism and in official bilingualism, but also in the evolution of regional and class-based varieties of both official languages. These varieties arise and flourish in the face of resistance on the part of the language professions and educational enterprises, which condemn them as nonstandard and incorrect.

Professor Poplack's sociolinguistic research confronts such normative ideologies with the data of actual speech, employing new methodologies and data resources. The projects she has undertaken in conjunction with her **Canada Research Chair** in Linguistics divide into three parallel currents. The first, also supported by a Killam Research Fellowship, investigates the evolution of vernacular Canadian French. The second deals with the linguistic and sociolinguistic concomitants of language mixing in bilingual contexts. The third focuses on the description of Canadian English, in both majority- and minority-language guises; the most recent addition is a new **Social Sciences and Humanities Research Council (SSHRC)**-funded project on the evolution of English in Quebec.

The Sociolinguistics Laboratory, founded in 1982 by Professor Poplack, houses the data for this research. Thanks to continuous **SSHRC** support in the form of standard research grants, the lab has provided many students (from undergraduates to postdoctoral fellows) with material resources, infrastructure support and world-class research training in core areas of sociolinguistics, while funding from the **Canada Foundation for Innovation** and the **Ontario Innovation Trust** has enabled the lab to hire specialized personnel to create and preserve databases, and to renovate and expand.

This research shows that bilingual language "mixing" reflects competence in both languages, rather than simplification or attrition. And it has refuted the attribution of nonstandard features of African American/ Canadian English to a prior creole, locating their origins in archaic dialects of English instead. Professor Poplack's work is essential to understanding the structure of nonstandard and minority language varieties, and to the development of progressive language curricula in a multilingual country.

FUNDING:	VALUE:
Canada Research Chair in Linguistics	$1,400,000
Canada Foundation for Innovation (CFI)	$61,971
Social Sciences and Humanities Research Council (SSHRC)	$249,966
Ontario Innovation Trust (OIT)	$61,971
Killam Research Fellowship	$141,000

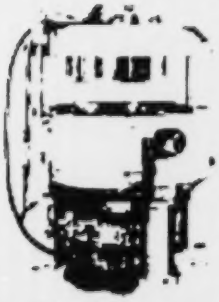
Research Team

Université d' Ottawa
University of Ottawa

Radionuclide production for cardiac positron emission tomography

Cardiac PET Team

Positron emission tomography (PET) imaging is an advanced technology that provides an accurate, noninvasive means to study physiology and treatment and to improve diagnosis. PET uses very short half-life radiolabeled physiological compounds to visualize the functioning heart. Many of these compounds require on-site production capabilities using a medical cyclotron and radiochemistry laboratory. The University of Ottawa Heart Institute (UOHI) with infrastructure funding from **Canada Foundation for Innovation, Ontario Research and Development Challenge Fund,** and **Ontario Innovation Trust,** under the direction of Dr. Rob Beanlands, has recently completed such a laboratory for the National Cardiac PET Centre (officially opened in June 2002). This is the only PET facility in Canada dedicated to cardiovascular disease. With this infrastructure support, Dr. Beanlands has brought together a research team that will enable innovative cardiovascular investigations and establish the UOHI Cardiac PET Program as international scientific leaders in this field.



Internal View

Dr. Beanlands and his team have developed research in four main areas: the metabolism of the heart; blood flow; the nervous system of the heart; and the development of new compounds to understand cardiovascular disease and treatment.

Cardiac-metabolism studies evaluate heart tissue viability and its ability to recover if blood flow is restored through intervention, or, conversely, the determination of heart-tissue scarring and the resulting lack of benefit from surgery or angioplasty. Metabolism imaging can also be used to evaluate the efficiency of both therapy (drugs) and interventions (pacing) on the heart's metabolism and work efficiency.

Cardiac blood flow can be quantified using PET imaging. This provides a tool to evaluate innovative therapies, such as anti-anginal therapies, exercise training, cholesterol-reduction therapy and stent insertion. Research in this area will also extend to new therapies such as angiogenesis (stimulation of blood vessel growth in the heart muscle) and stem cell therapy (use of stem cells to stimulate growth of heart muscle).

Novel compounds are being developed to evaluate the nervous system of the heart in patients with heart failure, hypertension and heart rhythm abnormalities. Specialized markers for cardiac PET imaging, including radio-labeled drugs, tissue-receptor agents and gene-therapy markers will be investigated.

These new compounds will also provide insights into the fundamental understanding of mechanisms of cardiac health and disease and will, ultimately, improve patient selection for specific therapies.

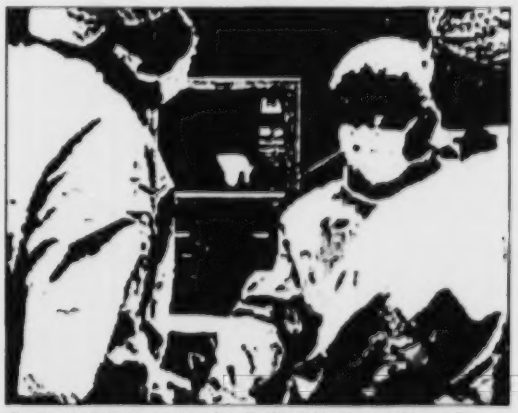
FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$2.1 million
Premier's Research Excellence Awards (PREA)	$150,000
Ontario Research and Development Challenge Fund (ORDCF)	$1.6 million
ORDCF-Ontario Consortium for Cardiac Imaging (OCCI)	$1.6 million
Ontario Innovation Trust (OIT)	$481,000

Queen's UNIVERSITY

High tech tools and fundamental mechanics get patients back in motion

The Human Mobility Research Centre (HMRC) is an international leader in the field of bone and joint disorders. Funding from the **Canada Foundation for Innovation (CFI)** has allowed Dr. Tassos Anastassiades and Dr. Tim Bryant—two of the founders of the HMRC—to realize their vision of a multidisciplinary research centre that would foster novel approaches to improving musculoskeletal health. Mechanical engineers design limb prostheses, medical doctors examine cartilage repair, chemists study tissue reconstruction, computer scientists develop 3-D images of damaged bones—they all work side by side, sharing ideas and coming up with innovative answers to old questions.

The centre is a partnership between Queen's and the Kingston General Hospital, and its work helps people with arthritis, osteoporosis, injuries and other related ailments. The research efforts are eclectic, but they share the same goal of helping people live fuller, more mobile lives through the development of innovative treatment strategies to advance the treatment of bones and joints. Dr. Bryant's research is helping to produce simpler, less expensive orthopaedic interventions using the principles of clinical mechanics. In one initiative, he is part of a team of researchers working alongside industry to produce a durable, cost-effective artificial foot for amputees in post-conflict countries. Another group at HMRC, which includes Dr. Joan Stevenson from the School of Physical Health and Education, has developed an ergonomically designed backpack for Canada's military. And in one of the centre's most ambitious projects, Dr. Mark Harrison, an orthopaedic surgeon, Dr. Inka Brockhausen, an arthritis expert, and Dr. Brian Amsden, a chemical engineer, are collaborating with Millenium Biologix to create a promising synthetic bone implant.



Dr. Randy Ellis (centre) assists Dr. Mark Harrison (left) and Dr. George Athwal (right) in realigning the knee of an arthritic patient.

Computer-enhanced medicine also plays a pivotal role in the HMRC's research program. Dr. Randy Ellis of the School of Computing recently received a CFI infrastructure grant to support his work in computer-assisted diagnosis and surgery of bone and joint disorders. Using powerful computer-modelling technology, Dr. Ellis helps doctors plan, simulate, execute and assess complex surgical procedures. Surgeons can review entire operations before ever making an incision, for example, and when they do make the cut they are assisted by computer guidance systems. The whole process leads to more efficient and accurate treatments. The specialized facilities for Dr. Ellis's work are located at Kingston General Hospital, where researchers from Queen's Division of Orthopaedics performed Canada's first computer-assisted knee and wrist surgeries in 1997 and 1998.

FUNDING:	VALUE:
Tim Bryant	
Canada Foundation for Innovation (CFI)/ Ontario Innovation Trust (OIT)	$3.4 million over 4 years
Randy Ellis	
Canada Foundation for Innovation (CFI)/Ontario Innovation Trust (OIT)	$3.8 million over 4 years
Ontario Research and Development Challenge Fund (ORDCF)	$2.25 million over 5 years

Queen's UNIVERSITY

Researchers outsmarting cancer cells by tackling drug resistance

Cancer cells are cunning adversaries—quick moving, constantly changing targets that often find ways to overcome even the most promising new drug treatments. Drug resistance is one of the fundamental problems cancer researchers around the world are trying to solve, and two Queen's scientists are leading the way.

Dr. Susan Cole and Dr. Roger Deeley are at the forefront of international efforts to understand the molecular mechanisms of drug resistance in human cancer cells. Their investigations have opened up a branch of research that is helping to identify new, more successful treatments for the numerous forms of the disease that do not respond to current drug therapy.

"While there are many drugs that can kill tumour cells, they frequently develop means of resisting these toxic agents," says Dr. Cole, a **Canada Research Chair** in Cancer Biology. Ten years ago, she and Dr. Deeley discovered a protein that confers drug resistance to lung cancer cells by pumping drugs out of the cells. When a large quantity of this Multidrug Resistant Protein (MRP) is produced in a cancer cell, the protein efficiently pumps away natural product drugs, a class of anticancer drug considered to be one of the most effective.

In the decade since this landmark finding, the two researchers have made great strides in uncovering the structure and function of MRP and have identified several additional MRPs. With funding over five years from the **Canadian Institutes of Health Research**, they are continuing to explore the factors that influence these proteins' actions in different types of cancer cells and trying to better understand the function of the low amount of MRP1 found in normal cells.

Doctoral student Deborah Greer (seated) and Dr. Anass Haimeur analyze high-resolution scans at Queen's Cancer Research Institute.

Researchers worldwide are working to advance their knowledge of MRP-related drug resistance, and several pharmaceutical and biotechnology companies are looking for ways to inactivate the MRP pump.

Drs. Cole and Deeley will soon move their labs to the new $16-million Queen's Cancer Research Institute, where the multidisciplinary environment and cutting-edge facilities will provide fertile ground for their future discoveries. "Ultimately, the knowledge gained by our investigations should help identify new drugs that can restore drug sensitivity to human tumours," says Dr. Cole.

FUNDING:
Canadian Institutes of Health Research (CIHR)

VALUE:
$182,400 per year for 5 years

Queen's UNIVERSITY

Gone fishing for clues about environmental change

The muddy bottoms of lakes hold vast archives of precious information. Over the years, Dr. John Smol and his international research team have extracted vital clues about climate change, pollution and aquatic species control from these murky waters.

Dr. Smol, a **Canada Research Chair** in Environmental Change and co-head of Queen's Paleoecological Environmental Assessment and Research Laboratory (PEARL), investigates the present and past ecology of lakes, ponds, rivers and other freshwater bodies. His research on the life processes of prehistoric lakes helps scientists cope with and prepare for current and future environmental challenges facing lakes around the world.

Lake sediments contain fossilized algae and tiny invertebrates, organisms that are sensitive to modifications in their aquatic environments and that, as a result, provide insight into ecological patterns over time. Using technology to examine sediment samples that are often thousands of years old, Dr. Smol reconstructs the environmental conditions that affected lakes over long periods of time. This data can be used to address a suite of environmental problems such as water quality degradation, lake acidification and climate change.

This unique analytical method has produced surprising findings about the impact of natural and human-induced environmental change on lakes, such as Dr. Smol's groundbreaking research on West Coast salmon stocks. With support from the **Natural Sciences and Engineering Research Council**, he and his team discovered that there were wide swings in salmon populations over the last 2,000 years—long before humans began fishing. Their discovery was made by tracking the sediment for distinctive nutrients that salmon, which have lived in the ocean and come back to a lake, leave after they die. The evidence suggests that climatic fluctuation was the primary cause of these early population shifts in the salmon, an important piece of information for those currently trying to preserve the fish. "Salmon are important ecological, economical and cultural resources in the North Pacific region, and their response to future climatic change is a matter of great uncertainty," says Dr. Smol.

Dr. Smol is now extending his salmon research to areas such as the Yukon and the northwestern United States, and he hopes to soon collect evidence from as far back as 12,000 years.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$136,500 per year for 5 years
Northern Studies Training Program	$3,000 per year (ongoing)

Dr. John Smol

Queen's UNIVERSITY

The National Microelectronics and Photonics Testing Collaboratory: Connecting Canada's research community

The Canadian Microelectronics Corporation (CMC) and Queen's University are bringing world-class test tools and techniques online for Canada's research community. The National Microelectronics and Photonics Testing Collaboratory will create access to specialized test facilities for Canadian researchers for increased scientific collaboration, knowledge sharing and high-calibre research. It is the first comprehensive test collaboratory of its kind in the world.

University researchers across Canada will be able to use the web to access the best available resources to test and validate high-performance microchip designs at the levels of speed and complexity that the technology makes possible. Over the next four years, the collaboratory will evolve to include 22 Canadian institutions from CMC's National Design Network that are conducting research in microelectronics and related fields.

CMC will manage a **Canada Foundation for Innovation (CFI)** $9.6 million award through Queen's University to develop this advanced research infrastructure, which will also be funded by other government sources and industry. The CFI award builds upon earlier investments from long-term investors such as the **Natural Sciences and Engineering Research Council**.

Dr. John Cartledge of the Department of Electrical and Computer Engineering at Queen's University will host this unique test facility. He says, "The CFI funding makes a significant contribution toward the development of a truly exceptional Photonics Systems Test Lab. Researchers from Queen's and other Canadian universities will have remote and on-site access to state-of-the-art instrumentation for virtually all aspects of photonic systems testing. The facility will play a crucial role in CMC's future activities as key functions traditionally implemented in the electronic domain continue to migrate to the photonics domain."

Increased access to leading-edge microchip and photonics test capability is pivotal to maintaining Canada's lead in university infrastructure for research and development in microelectronics and related fields. Dr. Brian Barge, President and CEO of CMC, says, "Canadian university researchers will now be able to verify and test their new designs at a speed and complexity that is equivalent to their design capability. This increases the competitive edge of highly qualified Canadian graduates, and the companies for which they work."

Located at Queen's University, CMC is playing an important part in Canada's scientific and economic future by providing advanced tools and technologies that enable leading-edge research and innovation in over 44 Canadian universities, and facilitating the high-quality training of future employees for microelectronics and related industries.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$9.6 million over 4 years
Ontario Innovation Trust (OIT)	$7.2 million over 4 years

Dr. John Cartledge

Queen's UNIVERSITY

Secrets of the universe revealed by SNO

A one-of-a-kind lab buried deep within the bedrock of Northern Ontario at Inco's Creighton Mine near Sudbury is helping scientists unravel some of the biggest secrets of the physical universe.

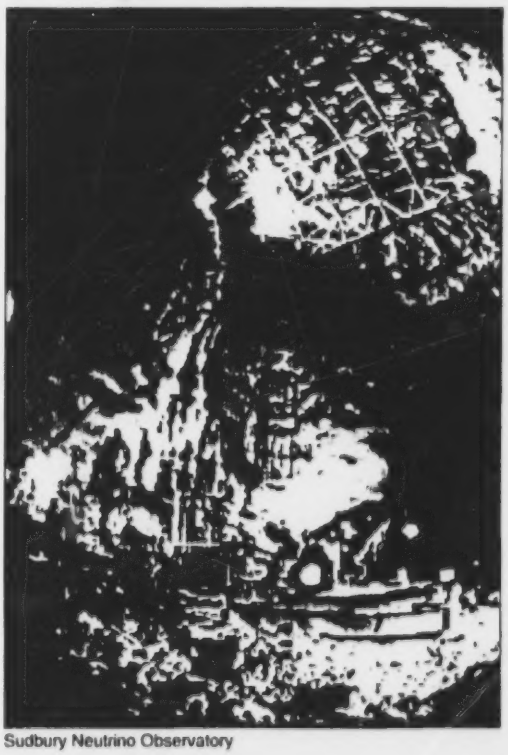
An international scientific collaboration at the Sudbury Neutrino Observatory (SNO) led by Dr. Art McDonald, Queen's physics professor, recently solved the well-known "solar neutrino problem" with 99.999 percent accuracy. Neutrinos are infinitely small particles with no electric charge, yet they are key basic building blocks of the universe. They exist in three types associated with three charged particles: the electron, the muon and the tau. The sun emits electron-neutrinos created through thermonuclear reactions, and previous research found far fewer electron-neutrinos reaching the Earth than what was predicted by the extensive theory of how the sun burns. SNO uses the properties of its unique heavy water core to detect and measure all three types of neutrinos. Recent publications by SNO researchers have documented the landmark finding that only one-third of the neutrinos emitted by the sun reach the Earth as electron-neutrinos, because neutrinos transform themselves into different types as they travel. The number of neutrinos of all three types is now in agreement with the predictions of solar theory.

The international journal *Science* ranked this discovery as one of the top three scientific breakthroughs of 2001. SNO researchers provided physicists with not only a resolution to an enduring mystery, but also data to extend particle physics theory that can help them tackle some of life's unanswered questions—the nature of matter, the structure of the stars and the future evolution of the universe. With the help of funding this year from the **Natural Sciences and Engineering Research Council**, Dr. McDonald and his colleagues look forward to extending their recent findings to further characterize neutrino properties.

Construction will soon be underway on a new underground laboratory at the SNO site with major funding from the **Canada Foundation for Innovation**, that will build upon SNO's successes in the field of particle astrophysics. In addition to expanding opportunities to study neutrinos, the facility will enable researchers to study other important particles that make up the missing Dark Matter in the universe.

The SNO team includes nearly 100 scientists at 11 universities and national laboratories in Canada, the United States and the United Kingdom. The Canadian university partners are the University of British Columbia, Carleton University, the University of Guelph, Laurentian University and Queen's University. The team for the new underground facility will also include the Université de Montréal.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$4.3 million each year
Canada Foundation for Innovation (CFI)	$38 million over 5 years



Sudbury Neutrino Observatory

Queen's UNIVERSITY

From playgrounds to politics: Finding ways to live in harmony

Dr. Wendy Craig

Bullying is not a stage that children grow out of, says Dr. Wendy Craig. Kids who learn how to acquire power through aggression may transfer these lessons to adult crimes such as sexual harassment, gang violence or spousal abuse. In partnership with students, educators, researchers, mental health workers and social policy makers, Dr. Craig works to identify the precursors of bullying and victimization in young people.

For almost 10 years, the Queen's psychology professor has been studying related issues such as the role of peer groups in social development, alcohol and substance use, teachers' attitudes toward bullying and mood disorders in bullies. One of her current projects, funded by the **Social Sciences and Humanities Research Council (SSHRC)**, is focused on dating violence and mental health among Canadian adolescents. Dr. Craig's work is also supported by a Health Career Award from **SSHRC**, the **Canadian Institutes of Health Research** and the National Health Research Development Program. Ultimately, her research is aimed at creating early interventions—including school prevention programs—that will stop childhood bullying before it evolves into adult violence.

At the other end of the spectrum, Dr. Jonathan Crush is working toward peace and stability at the national level, specifically in Southern Africa. Dr. Crush is the director of Queen's Southern African Research Centre (SARC), a focal point for Canadian efforts to contribute to regional co-operation and development in the 13 countries that make up Southern Africa. "The challenges of economic and social development in that region are enormous, and SARC is positioned to help Canadians play a role," he says. Queen's researchers have a long association with this area of the world and are known for their leading expertise on diverse issues such as environmental and social policy, food security, human rights and HIV/AIDS.

Dr. Crush's research is funded by the Canadian International Development Agency, the International Development Research Centre and the Bureau for Population, Refugees and Migration, and most recently by a grant from **SSHRC** for exploring the rise of xenophobia in post-apartheid South Africa. Since the country's first democratic elections in 1994, there has been significant progress in extending basic rights to all citizens, yet there has also been an unexpected rise in anti-foreign sentiment. Dr. Crush and his multidisciplinary research team are documenting, analyzing and attempting to explain this intolerance toward those defined as outsiders to the new nation. "The research results will inform South Africa's public education campaigns designed to promote tolerance and build social cohesion at the national and community level," he says.

FUNDING:	VALUE:
Jonathan Crush	
Social Sciences and Humanities Research Council (SSHRC)	$100,000 over 3 years
Wendy Craig	
Canadian Institutes of Health Research (CIHR)	
–Career Award	$125,000 per year for 5 years
–Net Grant	$250,000 per year for 5 years
Ontario Mental Health Foundation	$65,000 per year for 5 years
Hospital for Sick Children Foundation	$70,000 per year for 2 years
Social Sciences and Humanities Research Council (SSHRC)	$90,000 per year for 4 years

SARC Director Jonathan Crush (far right) with partners from Mozambique, Zimbabwe, Namibia, Swaziland, Botswana, South Africa and Lesotho.

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RYERSON

Multimedia research

Dr. Ling Guan

The rapid development of multimedia technologies is profoundly changing the way we access information and communicate. It impacts how we learn and educate, provide and access services, conduct business and entertain. The interaction between media—of speech, audio, image, video, text and graphics—provides opportunities for researchers. As digitization and encoding of image/video have become more affordable, computer and web database systems are beginning to store voluminous multimedia data. However, while data acquisition technology has advanced rapidly, technologies for processing and transmitting multimedia information in large archives have not kept pace.

The work of Dr. Ling Guan of the Department of Electrical and Computer Engineering and Tier 1 **Canada Research Chair** in Multimedia and Computer Technology at Ryerson will be a focal point of fundamental and applied research in the coding, indexing and retrieval analysis, and transmission of multimedia data over Internet/wireless networks. His research, which is supported by the **Natural Sciences and Engineering Research Council** and the **Canada Foundation for Innovation**, will help the Canadian information technology industry maintain and increase its global competitiveness by enabling multimedia communication hardware and software with enhanced performance, high reliability, compact size and minimal manufacturing costs. Dr. Guan and his research team is developing new multimedia processing and communication techniques that will result in applications for telemedicine, distance education, e-commerce, teleconferencing, security/surveillance and e-entertainment.

An interdisciplinary research team is working in the newly established Laboratory for Multimedia Processing and Communications (LMCP) to determine how new research results will integrate into a communications network and perform under real-time and realistic operating conditions. In addition to its main function as an incubator for developing new ideas in multimedia research, the laboratory will also serve as a test-bed for the integration of information technology into industrial applications and technology transfer.

FUNDING:	VALUE:
Canada Research Chair	$1.4 million
Natural Sciences and Engineering Research Council (NSERC)	$208,000
Canada Foundation for Innovation (CFI)	$125,000
Ontario Innovation Trust (OIT)	(matched to CFI) $125,000

RYERSON

Children and adults with disabilities assess the impact of home care on their lives

Dr. Kari Krogh

Funding from the Canadian Institutes of Health Research (CIHR) and Social Sciences and Humanities Research Council (SSHRC) has enabled Dr. Kari Krogh, CIHR Senior Research Fellow, to establish an active research program at Ryerson University in the emerging discipline of Disability Studies. Her current research project is designed to examine the role of home support/home care in the lives of children and adults with disabilities. Personal narratives provide the basis for an analysis of the impact of home care policy on health, education and employment for people with disabilities.

Developed through an SSHRC Research Development Initiative Grant, her research method includes innovative ways to involve people with disabilities throughout all the stages of research. This involves the collection of data in multimedia formats such as digital video, which has facilitated broad dissemination (for example, the use of research findings for online student education, professional training and community involvement in health care policy reform). Her research efforts have also extended to exploring partnerships with the private sector to develop related communication technologies. As a result of the work of Dr. Krogh, her associates and several colleagues, the first School of Disability Studies in Canada has been established, attracting significant private sector contributions.

Preliminary findings of Dr. Krogh's work illustrate the significance of home support in increasing life opportunities for people with disabilities to participate in and contribute to their communities—and ultimately in enabling them to act as full citizens in society. Her research team includes students from Health Sciences, Nutrition, Disability Studies, Early Childhood Education as well as Communication and Culture programs. Community organizations such as the Council of Canadians with Disabilities, a national network of disability organizations, are involved as research partners.

Dr. Krogh's work has achieved international recognition and she has received several academic awards, including the Royal Society of Canada's Alice Wilson Award. The results of her work can be found in medical and social science journals such as *Seizure*, *Augmentative and Alternative Communication* and *The Canadian Journal of Rehabilitation*, as well as in community and professional publications.

FUNDING:	VALUE:
Canadian Institutes of Health Research (CIHR) Senior Research Fellowship	(approx.) $300,000
Social Sciences and Humanities Research Council (SSHRC) Standard Research Grant	$150,000
SSHRC Research Development Initiative Grant	$34,000

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RYERSON

Minimally invasive laser therapies for cancer management

Research on laser and ultrasound thermal therapies has been ongoing for the past 20 years. The clinical potential of thermal therapy has been demonstrated in the liver, kidney, breast, brain and prostate. However, currently thermal therapy is not routinely practiced clinically, due largely to the lack of treatment-planning algorithms, cost-effective treatment monitoring, online control and accurate assessment of treatment outcome. Dr. William Whelan, assistant professor of the Math, Physics and Computer Science Department, has received funding from the **Natural Sciences and Engineering Research Council** for his research in thermal therapy and infrastructure funding from the **Canada Foundation for Innovation (CFI)** to establish a Facility for Biophysics Research and Development of Minimally Invasive Thermal Therapies at Ryerson University. This CFI-supported facility houses the latest technology and infrastructure support necessary for cutting-edge thermal therapy research and development. The success of Dr. Whelan's group has also led to the recent establishment of research collaborations with two start-up medical technology companies, AutoLITT Inc. (Winnipeg, MAN) and LaserSonics (Galveston, TX).

In addition, Dr. Whelan is currently a co-investigator on a multi-institution Photonics Research Ontario (PRO) grant entitled Technologies and Applications for Photodynamic Therapy (PDT), which involves Ryerson University, the University of Toronto, McMaster University, the Ontario Cancer Institute/Princess Margaret Hospital and a consortium of Ontario companies including Walsh Medical and P&P Optica. The PRO grant complements the thermal therapy studies in that the final objective of this larger collaborative effort is to develop a multiple-modality treatment platform that will include thermal therapy and PDT.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI) matched by Ontario Innovation Trust (OIT)	$210,869
	$210,869
Natural Sciences and Engineering Research Council (NSERC)	$278,199
As Co-Investigator: Photonics Research Ontario	$329,000
National Cancer Institute of Canada	$305,494

The multidisciplinary research team (clockwise from left standing, Mr. Sean Davidson, Ms. Vanessa Choy, Mr. Lee Chin, Dr. William Whelan and Dr. Alex Vitkin; Drs. Michael Kolios and Michael Sherar are missing from photo) are based at Ryerson and the Ontario Cancer Institute/Princess Margaret Hospital. They have recently developed a treatment-planning software platform for thermal therapy of prostate cancer, based on pre-treatment ultrasound images of the prostate.

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RYERSON

Geovisualization and business geomatics

Dr. Tony Hernandez

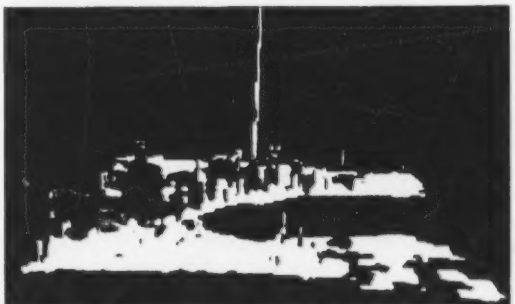
Dr. Tony Hernandez, Centre for the Study of Commercial Activity (CSCA) School of Applied Geography, leads his research team focusing on the development and evaluation of new spatial technologies to provide decision support to Canadian business organizations. The team includes a number of graduate students in the Masters of Spatial Analysis program and industry practitioners. The research aims to promote the awareness and adoption of innovative spatial decision-support approaches, provide training and facilitate knowledge transfer.

Funding from the **Natural Sciences and Engineering Research Council, Social Sciences and Humanities Research Council (SSHRC)** and **Canada Foundation for Innovation**, together with the provincial government (**Ontario Research and Development Challenge Fund**) and private partnership support, has been instrumental in developing a geovisualization research capacity at the CSCA at Ryerson University. The Centre currently houses leading-edge data visualization technology to facilitate research in decision support science. It is also a major node in business geomatics within the GEOIDE Network of Centres of Excellence.

Dr. Hernandez's **SSHRC** Initiative on the New Economy research addresses the challenge faced by Canadian businesses today: how to turn vast amounts of consumer data into valuable insight and knowledge. Corporations are transforming their business models and organizational structures to capitalize on technology-enabled competitive opportunities. As accountability and risk have increased, so has the need for decisions to be based on both qualitative insights and structured quantitative analysis.

Geovisualization (also referred to as visual data mining) is a process of selecting, exploring and modelling large amounts of spatial data to uncover previously unknown patterns of data for competitive advantage. By applying visualizations and data-mining techniques, businesses can fully exploit data warehouses and associated large-scale relational databases, to gain a greater understanding of the markets in which they operate. For example, animated 3D visualizations enable users to explore data interactively and discover meaningful new patterns quickly. Research at the CSCA aims to develop geovisualization technologies and evaluate their effectiveness within business decision-making applications. The research builds on a number of partnerships between the CSCA and major Canadian business organizations.

FUNDING:	**VALUE:**
Social Sciences and Humanities Research Council (SSHRC): Initiative on the New Economy (INE)	**$89,889**



Map of Greater Toronto Area depicting retail sales data (height of bars). This form of 3D visualization provides an efficient and effective means of revealing spatial trends in data. For example, the map shows the significant sales per capita in the downtown core of Toronto. The data can also be animated over a series of time periods to reveal the changing spatial nature of retail sales. In addition, the map view can be rotated to allow the user to explore the data from a range of perspectives

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UNIVERSITY OF TORONTO

Brenda Andrews—Department of Medical Genetics and Microbiology

Problems in human relationships frequently come down to bad communication: mixed messages, misinterpreted statements and the insidious game of "broken telephone" that can transform an innocent remark into the start of a scandal. The work of Brenda Andrews in U of T's Department of Medical Genetics and Microbiology shows that cells are no different.

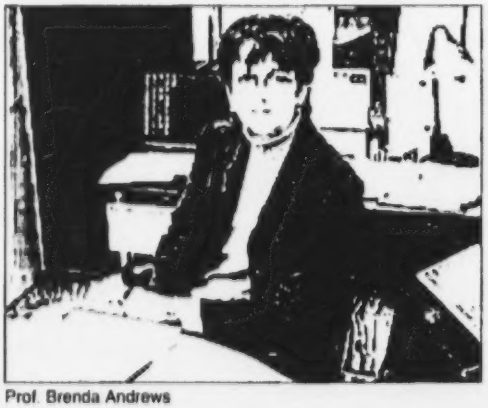
Professor Andrews studies the molecular mechanisms controlling the cell cycle: how cells divide, communicate, stop growing and die. Her research shows that communication between cells, facilitated by proteins known as cell regulators, is crucial in protecting us against disease and in helping us to age healthfully. Healthy cells interpret a series of complex signals correctly due to cell regulators; bad communication between cells can result in tumours and other dysfunctions.

Using the budding yeast Saccharomyces cerevisae as a model, Professor Andrews and her team use DNA microarray analysis, chromatography, genetic screening and mass spectrometry to shed light on the relationships between cells and cell regulators. The results will have a direct impact on efforts to create new drugs and treatments for cancer and other common ailments. Chemotherapy, for example, could be focused more effectively on destroying cancerous cells rather than sweeping up the healthy ones in its path.

While Professor Andrews works toward solving these universal health issues, she is also creating some valuable momentum for Canada's economy. Together with U of T's Charles Boone, she is a scientific founder of Virtek Proteomics Inc., a spin-off company that provides state-of-the-art technology for microarray analysis.

The Andrews lab was a beneficiary of one of the largest industrial grants ever awarded by the Medical Research Council (MRC) in 1995, and has continued to receive support from MRC and the **Canadian Institutes of Health Research** since then. This ongoing funding will allow Professor Andrews and other outstanding U of T scientists to make significant improvements in our understanding of aging, tissue rejuvenation and cancer—an understanding that will better the lives of countless Canadians.

FUNDING:	**VALUE:**
Canadian Institutes of Health Research (CIHR)	**$917,500 over 5 years**



Prof. Brenda Andrews

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UNIVERSITY OF TORONTO

Baher Abdulhai—Department of Civil Engineering

Dr. Baher Abdulhai

Every day, thousands of commuters struggle through ever-increasing traffic congestion on Toronto's highway system. Everyone hates it—but one U of T researcher is doing something about it.

Dr. Baher Abdulhai is using investment from the **Canada Foundation for Innovation** to investigate a growing problem in major Canadian cities—traffic congestion. As the founder and director of U of T's unique-in-Canada Intelligent Transportation Systems Centre and Testbed, Dr. Abdulhai and his team are developing ways to ease the negative offshoots of our car-obsessed society, from traffic jams to decreased safety on our roads to pollution.

Using state-of-the-art technology with what Dr. Abdulhai calls a "melting pot" of researchers and practitioners, the work will focus on a variety of projects, such as designing traffic control methods that capitalize on a network of vehicle detectors on the roads to make control responsive to traffic fluctuations. The testbed facility houses high-end computer technology, a video wall and a virtual micro-simulation model of the Toronto road network that supplements real-world data. This real-time environment makes the testbed a "perfect classroom for students and a superb research lab for developing new technologies."

Dr. Abdulhai, a CFI New Opportunities award winner in 1998, first became interested in the topic when doing doctoral and post-doctoral work in southern California—a region legendary for its traffic snarls. Now, thanks in part to federal infrastructure funding, Canada will become a world leader in a field that is directly relevant to the lives of many of its citizens.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$176,000

UNIVERSITY OF TORONTO

Kim Vicente—Mechanical and Industrial Engineering

The founding director of U of T's Cognitive Engineering Laboratory, Kim Vicente is one of Canada's fastest-rising scientific stars. In 1999, *TIME* magazine honoured him as one of 25 "leaders for the 21st century." His many research awards include two major projects funded by the **Natural Sciences and Engineering Research Council (NSERC)**: a four-year Discovery grant and a Collaborative Research and Development grant, in partnership with Nova Chemicals.

Professor Vicente's accolades stem from outstanding work in the field of human factors engineering. He studies the design of complex computer interfaces in today's high-tech workplaces: aviation cockpits, nuclear power plants, auto assembly lines and hospitals, to name a few. "We need to create systems that fit human nature rather than expecting people to adapt and contort themselves to fit the technology," he says, and has suggested that better human factors design could have averted the controversy surrounding the results of the 2000 U.S. presidential race.

The Cognitive Engineering Laboratory team is working to redesign human-computer interaction. In doing so, they will improve workers' efficiency and contribute to improved workplace health, safety and job satisfaction.

Professor Vicente's book, *Cognitive Work Analysis: Toward Safe, Productive, and Healthy Computer-based Work*, has quickly become one of the key texts in this area of inquiry. He is cross-appointed to U of T's Department of Computer Science and Institute of Biomaterials and Biomedical Engineering, and his teaching and consultations with industry consume much of the time he has left over from research activity.

With funding from **NSERC** and other sources, Professor Vicente's research will help to ensure a safer, healthier, more efficient environment for workers in Canada and throughout the world.

FUNDING:	**VALUE:**
Natural Sciences and Engineering Research Council (NSERC)	**$144,744 over 4 years**

Prof. Kim Vicente

UNIVERSITY OF TORONTO

Beth Savan—Environmental Studies Program, Innis College

Prof. Beth Savan

Beth Savan, director of environmental studies at Innis College, believes that creating a sustainable environment involves more than improving our natural surroundings. As part of a three-year project called Promoting Community Sustainability: Linking Research and Action, Professor Savan and colleagues in other universities, government, businesses, non-profit organizations and the community are building alliances with one another to develop sustainable policies and practices in the City of Toronto.

Funded by the Community-University Research Alliances program of the **Social Sciences and Humanities Research Council (SSHRC)**, the 10 sub-projects that compose the overall initiative have a common element: they link community groups with academic researchers. One sub-project, for example, seeks ways to help communities monitor their local environment in the face of government cutbacks to environmental monitoring networks. Community groups want to maintain an understanding of their local environment, and to do that they need monitoring methods that are practical and relatively easy to use. So academics, working with community groups, are developing monitoring methods that are accessible to lay people.

Ultimately, notes Professor Savan, "new policies and approaches in Toronto will only be sustainable if social, economic and environmental factors are all given consideration in the decision-making process." Thanks in part to **SSHRC** support, these new approaches are on their way to becoming reality.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC), Community-University Research Alliances (CURA)	$750,000

TRENT
UNIVERSITY

Emotion and health—emotional intelligence and academic achievement

Dr. James Parker

Educators have always been aware of the simple and consistent fact that some students are academically successful while others are not. Psychologists, educators and researchers have long speculated on the root causes of this issue, identifying cognitive abilities, previous academic performance and personal issues such as birth order as possible factors in the mastering of academics. However, the research in this area has been limited. Many questions have been left unanswered in identifying exactly why some people succeed in school.

Dr. James Parker, **Canada Research Chair** in Emotion and Health, is addressing these questions in his research. He is seeking answers to such lines of thought as "how do personality and emotion contribute to academic success" and "how might our emotional abilities contribute to our mental or physical health?"

The answers may ultimately come down to something called emotional intelligence. This concept is made up of social and emotional competencies that span intrapersonal abilities (which include recognizing and understanding one's feelings), interpersonal abilities (recognizing the feelings of others and expressing empathy), adaptability (adjusting one's behaviours and emotions to changing situations and conditions) and stress management (which includes the ability to resist or delay impulses).

Dr. Parker uses a specific and detailed set of questions to measure a person's overall emotional intelligence and with the information gleaned from this kind of survey, can identify trends.

Over the past three years, for instance, Dr. Parker has been able to survey entire groups of first-year students arriving at Trent University. This study—the Trent Academic Success and Wellness Project (TASWP)—is one of the most ambitious studies ever conducted in Canada on personality and health factors that influence academic success.

Dr. Parker doesn't just identify the emotional intelligence of first-year students on a one-time basis. He is also tracking the academic achievement of these students as they move through their undergraduate career. Results indicate associations between those students who score poorly on emotional intelligence tests and those who drop out of school. This may eventually lead to novel tools with which universities can use to identify students most likely to drop out, and interventions that may be employed to help them achieve their academic goals. It may also lead to tools that health care organizations can use to identify patients susceptible to mental disorders or unexplained physical health problems.

Dr. Parker's research is funded by the **Social Sciences and Humanities Research Council**, the **Canadian Foundation for Innovation**, the **Premier's Research Excellence Awards** and the **Canada Research Chairs Secretariat**.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC) Research Chair	$100,000/year for 5 years
Canada Foundation for Innovation (CFI)	$36,234
External funding from the Social Sciences and Humanities Research Council (SSHRC)	$89,000

TRENT UNIVERSITY

Conservation genetics and biodiversity—DNA profiling and wildlife conservation

If you have ever seen a North Atlantic Right Whale surface in the Bay of Fundy, it is unthinkable to imagine the world without such a majestic animal. Yet the harsh fact remains that this small population of approximately 350 whales is at high risk for survival. Dr. Bradley White, a world leader in the field of population genetics, whose work in DNA research is renowned, is determined to use his research to help species such as the Right Whale.

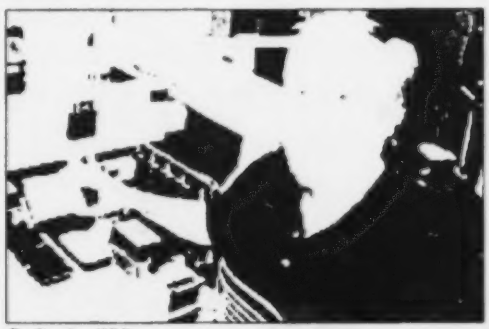
By employing the latest in automated genomic test equipment, Dr. White is in the process of developing a robotic system capable of providing high-volume, low-cost DNA sampling and profiling. For endangered species, this important work may mean the difference between survival and extinction.

Dr. White, **Canada Research Chair** in Conservation Genetics and Biodiversity, is the founder of the Wildlife Forensic DNA Laboratory, located at Trent University since 1997. The primary work of Dr. White, and members of his research team, involves collecting DNA samples from animals. These samples, which are stored at the lab, are analyzed to assess key genetic issues. In the case of the Right Whale, for instance, it is speculated that inbreeding might be a factor in the population's decline. Genetic analysis will provide answers.

Other endangered or threatened species currently undergoing study in Dr. White's lab include the Puerto Rican Parrot, the St. Lawrence Estuary Beluga Whale, the Swift Fox, the Eastern Wolf and, as a botanical example, the Wood Poppy. In collaboration with the Ontario Ministry of Natural Resources (OMNR), Dr. White chairs the Natural Resources DNA Profiling and Forensic Centre (NRDPFC), and DNA profiles are being developed for populations of caribou, moose, white-tailed deer, wolves, black bears and elk. The majority of these species have been listed as indicator species and are crucial in developing adaptive management strategies, particularly in examining the sustainable use of Ontario forests.

The innovative work of the NRDPFC has been integral in solving a number of wildlife infractions. Over 750 forensic cases have involved DNA analysis in providing evidence for convictions, which is good news for Ontario wildlife. As well, DNA profiling is able to provide information about such things as parentage and population identification. These facts can help researchers assess methods for assisting the preservation of wildlife.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)	$100,000/year for 5 years
Canada Foundation for Innovation (CFI)	$350,000
NSERC Operating Grant	$95,400 over 2 years
Department of Fisheries and Oceans	$8,000



Dr. Bradley White

University of Waterloo

Regulation of skeletal muscle fatty acid transport

Fatty acids are among the most important biological materials required to sustain life. These lipids can:

- Provide fuel for energy production to maintain the ability to use our muscles;
- Act as precursor products for molecules that signal many complex cell functions; and
- Build cell membranes and participate in converting the genetic information to functional protein products.

Fatty acids are stored in the fat cells of the body. Under the influence of selected hormones, fatty acids are released from fat cells into the blood stream. Once in the blood, fatty acids are delivered to all other tissues of the body, where they can be taken up to fulfill their biologic missions.

For many years it had been dogma that fatty acids could simply enter any cell via passive diffusion across the cell wall (plasma membrane). In 1995 Dr. Arend Bonen's team began to challenge this existing dogma, devising a method to show that fatty acids can cross the plasma membrane with the help of several proteins (fatty acid binding proteins). This suggested that the fatty acid process could possibly be controlled through controlling these fatty acid uptake binding proteins. The importance of this control has been revealed in the past few years, particularly with respect to type 2 diabetes—a condition that is becoming an epidemic in Western industrialized societies.

Another important discovery was Dr. Bonen's recent finding that insulin (the key hormone whose function is impaired in type 2 diabetes) can act to move the fatty acid transport proteins to the plasma membrane within a few minutes. This revealed an entirely new biologic role for insulin, one that was not previously known nor had been predicted. Dr. Bonen's research focus now is to determine how insulin can cause fatty acid binding proteins to move within cells. Such understandings may identify novel therapeutic targets for the treatment of type 2 diabetes.

FUNDING:
Canadian Institutes for Health Research (CIHR)

VALUE:
$360,750 for 4 years

Dr. Arend Bonen, Department of Kinesiology
Faculty of Applied Health Sciences
Web Location: *www.ahs.uwaterloo.ca/kin/people/faculty/bonen.htm*

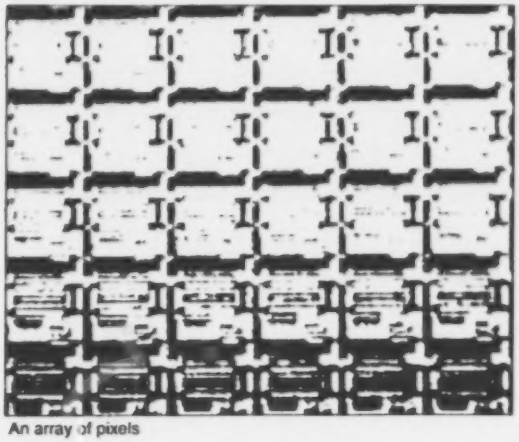
University of Waterloo

Giga-to-nano electronics fabrication facility

Silicon-based and related thin-film technologies are on the verge of tremendous development. Today these technologies stand at the level of the television in the 1930s or the transistor in the 1950s. As such, they are creating numerous new and exciting research directions and knowledge, along with tremendous opportunities for innovation, global leadership and commercial exploitation by virtue of their disruptive nature. The technologies extend well beyond the conventional computer chip to include large area (human size) glass and plastic electronics, mechanically flexible electronics, instruments/machines/laboratories on chips, self-assembled transistors and molecular electronics.

The University of Waterloo (UW) has created a state-of-the-art facility unique to the region and Canada, to address these emerging research and application areas. The focus of the facility is on electronic systems ranging from large area "giga" systems (1 billion pixels) to "nano" technology (with particular emphasis on interfacial engineering and intelligent interfaces).

Flexible wafer



An array of pixels

The facility integrates a versatile range of thin-film manufacturing, assembly, testing and characterization equipment, and will be central to a new world-class institute for giga-to-nano electronics, now being developed at UW to bring Canadian researchers together. This initiative has secured financial and materials support from a number of sources including **Ontario Innovation Trust, Canada Foundation for Innovation**, UW, COMDEV, MVS and Westaim.

FUNDING:	**VALUE:**
Ontario Innovation Trust (OIT); Canada Foundation for Innovation(CFI); And various industrial partners	**$17 million**

RESEARCHERS:
Arokia Nathan (PhD), Raafat Mansour (PhD), Andrei Sazonov (PhD), Siva Sivoththaman (PhD), Department of Electrical and Computer Engineering, Faculty of Engineering; Alex Penlidis (PhD), Department of Chemical Engineering, Faculty of Engineering; Vassili Karanassios (PhD), Department of Chemistry, Faculty of Science; Graham Strong (PhD), School of Optometry, Faculty of Science; John Rowlands (PhD), University of Toronto; Gordon Hayward (PhD), University of Guelph

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University of Waterloo

Temporal self-appraisal theory

Dr. Michael Ross
Dept. of Psychology, Faculty of Arts
Web Location:
www.arts.uwaterloo.ca/~mross/

The mind can play tricks on memory. Dr. Michael Ross, a professor of psychology at the University of Waterloo, has long studied these tricks. He has shown, for example, that people who fall out of love remember caring less for their former partner than they actually did. Dr. Ross has also found that people who take useless self-improvement courses manage to convince themselves that they have improved, not by distorting their present status but by retrospectively exaggerating their deficiencies before the course. In essence, participants say to themselves: "I may not be perfect now but I was much worse before taking the course." In these examples (and others studied by Dr. Ross and his students), people revise the past in ways that help them to feel good about their decisions and actions.

In recent research with colleague Anne Wilson, Dr. Ross has found that the mind also plays tricks on people's subjective experience of time. Although people typically feel closer to episodes that happened yesterday than to events that occurred earlier, subjective experience does not always track actual time. Many real-life experiences, such as changing jobs or romantic partners, affect feelings of subjective distance from prior episodes, making them feel more remote. Personal experiences may also cause the distant past to feel close, for example, revisiting a childhood haunt or attending a school reunion may make ancient history seem recent.

As well, Dr. Ross finds that differences in the evaluative implications of past episodes affect people's feelings of subjective distance. To protect their self-regard, people are motivated to feel farther from past failings than from achievements, even when calendar time is the same. Distancing helps individuals put undesirable behavior behind them.

Dr. Ross's research helps us to understand the links between autobiographical memory and self-identity. Although memory is usually accurate enough to serve our everyday needs, it is certainly not an objective record of the past. People construct pasts that help them to maintain their preferred representations of themselves. His findings on memory distortion have been applied in various settings in which the veridicality of memory is important, including clinical therapy, eyewitness testimony and surveys.

FUNDING:
Social Sciences and Humanities Research Council (SSHRC)

VALUE:
$129,000

University of Waterloo

Structure, energetics and reaction dynamics of gaseous ions

Dr. Terrance McMahon is investigating the intrinsic properties of structure, energetics and reactivity of gaseous ions. His work has many applications ranging from understanding how complex molecules are "synthesized" in interstellar clouds to probing how large biological macromolecules undergo folding in living systems.

A very important discovery was made in his lab shortly after his team completed the construction of a unique apparatus for carrying out experiments. The apparatus uses very strong magnetic fields created by superconducting magnets, which must be cooled to -270° C: just above absolute zero.

An ultra-high vacuum chamber placed within this magnetic field is able to trap gaseous ions for very long periods of time—up to tens of hours—under conditions where virtually no collisions of these species take place, either with other molecules in the chamber or with the walls of the chamber itself. Dr. McMahon's team observed that some of the molecules placed in the chamber underwent decomposition on a very slow time scale in a way that was not explicable on the basis of conventional models for understanding such reactions.

Dr. Terrance McMahon
Department of Chemistry, Faculty of Chemistry
Web Location: *www.science.uwaterloo.ca/chemistry/mcmahon.html*

Dr. McMahon's team proposed, and it is now recognized, that such molecular decompositions can occur via the interaction of these species with the background, ambient "black-body" radiation that is emitted by any object above a temperature of absolute zero. Noble Laureate Jean Perrin suggested this possibility in 1916, but his suggestion was dismissed by other luminaries such as Einstein and Langmuir, based on a lack of knowledge of the nature of interaction of infrared radiation with molecules.

This experiment was the first ever able to create conditions where Perrin's hypothesis could be adequately tested, and the results dramatically showed that black-body radiation can indeed induce the dissociation of molecules.

FUNDING:	VALUE:
Natural Sciences and Engineering Research Council (NSERC)–Discovery Grant	$125,000/year for 4 years

Western

Building the DNA computer

Computer science professor and **Canada Research Chair** Lila Kari is exploring the possibilities of using DNA as a programming language to solve highly complicated problems. Dr. Kari's research has been funded by a $280,000 grant from the **Canada Foundation for Innovation** and the **Ontario Innovation Trust**, along with over $215,000 in operating grants from the **Natural Sciences and Engineering Research Council**.

Biocomputing is a field that is only seven years old. "Actually you have to somehow twist around the tools that are available in the molecular biology lab and try to make them simulate arithmetic and logic operations," says Dr. Kari. One way to accomplish this is by incorporating the technique of genetic recombination where strands of DNA are cut and each are spliced to neighbouring strands. At first glance, "this apparently doesn't have any connection with computation," says Dr. Kari. "However, we were able to prove theoretically that you can use this single operation to simulate any operation in any electronic computer. This means that, in theory, you can build a general purpose DNA computer." The next challenge is to transfer theory from the test tube into unicellular organisms.

Even though the computers using DNA will be very small, the problems they are designed to solve are on a massive scale. "If you have a problem and solving it with an electronic computer will take ten thousand years, you can do it with DNA computing in three weeks," says Dr. Kari.

A graduate of the University of Turku, Finland, Dr. Kari first came to Western in 1993 as a visiting professor, decided to stay and by 2000 was promoted to associate professor in the Computer Science Department. In 2002, she was awarded a Canada Research Chair in Biocomputing. "My field of expertise...is the part of theoretical computer science called formal languages [which] deal with letters and strings of letters. In retrospect it seems natural to use this model in DNA computing because you can think of DNA as a string of letters."

Some of the results obtained in purely theoretical computer science now have relevance for biology.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)/Ontario Innovation Trust (OIT)	$280,000
Natural Sciences and Engineering Research Council (NSERC)	$215,000

Dr. Lila Kari, Computer Science Professor and Canada Research Chair

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Western

Leading Thinking

SHARCNET—power, partnership, performance

A current theme in leading-edge research is the desire to describe and predict the behaviour of complex systems over widely varying scales of length and/or time. Computational modelling of complex systems holds the promise of bridging these gaps of scales, but doing so requires massive and flexible high-performance computing resources.

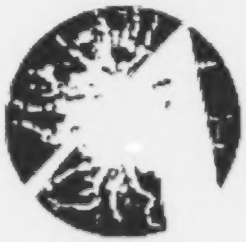
With its headquarters at Western, SHARCNET is a consortium of colleges and universities in "cluster of clusters" of high-performance computers, linked via an advanced fibre optics network. Established in 2000 as a **Canada Foundation for Innovation/Ontario Innovation Trust** project, the consortium was subsequently expanded to form a broader collaboration with industry to provide the basis for a successful **Ontario Research and Development Challenge Fund** application.

Currently, SHARCNET's academic partners include the University of Western Ontario, the University of Guelph, McMaster University, Wilfrid Laurier University, the University of Windsor, Fanshawe College and Sheridan College.

SHARCNET's unique computational infrastructure, combined with an active academic-industry partnership including Compaq Canada, Platform Computing, Bell Canada, Nortel Networks, Quadrics, Supercomputing World and Hewlett Packard enables world-class computational research in critical areas of science, engineering and business. SHARCNET's goals are to:

- Accelerate the production of research results to meet the needs of researchers and industry partners on a time scale necessary for today's academic and competitive business environments;
- Attract and retain the best students, researchers and companies who currently must go outside Canada for leading computational expertise and hardware; and
- Provide a focal point for linking academic researchers and corporate partners and encourage cross-fertilization to commercialize research results, and create new companies—essential elements for the continued development of Canada's knowledge-based economy.

SHARCNET'S computational strategy is to provide scalable resources that will drive internationally competitive science. To that end, it has established a hierarchy of capability consisting of over 400 alpha processors and large symmetric, multiprocessor computers. The grid hierarchy of network capability connecting these processors ranges from tightly coupled



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clusters of 50 to 150 processors to very high bandwidth campus-area networks and wide-area networks. These high-speed network connections are provided by Quadrics Supercomputing World and Nortel DWDM fibre optic communications. The computers use Platform Computing's LSF V5 Workload Management Software to ensure unprecedented performance. The SHARCNET structure is designed to provide not only optimum processor speeds but also optimum access to the processors and computers and access to the system. In addition, dedicated systems administrators are located at each major site to optimize performance, availability and access.

SHARCNET seeks to partner with leading-edge companies that are interested in developing or utilizing high-performance computer hardware, software and communications technology. SHARCNET's current computer hardware and software partners have provided management software, operating systems and applications software that excel in a specific computing platform as well as across an array of computing platforms. SHARCNET is seeking additional industrial and commercial partners that are interested in advancing high-performance computing, developing applications and using computational science in research activities.

Development of an effective "High Performance Computing (HPC) culture," which is a central element of competitive science, business and industry, drives SHARCNET's philosophy, implemented through each of the following:

- The SHARCNET Chairs program to enable strategic faculty hiring in targeted areas of computational science;
- Comprehensive fellowship matching funds to enable research and training at the undergraduate, graduate and postdoctoral level;
- High-level HPC consultation to provide training in parallel programming, assist in utilizing resources and offer programming support; and
- Visitor and lecture support.

SHARCNET has the requisite infrastructure, networks, and resources to provide facilities for world-class computational research. The focus is currently on the following strategic areas:

- Genomics, bioinformatics and biocomputation;
- Physics and chemistry of advanced materials;
- Fluid dynamics in engineering, aerospace, astrophysics and geophysics;
- Business and finance; and
- High-performance computing, visualization, networks and grid computing.

Recent examples of SHARCNET supported research include the simulation and development of models for the pricing of electricity and telecommunications services; investigation and understanding of the behaviour of simple molecular liquids under extremely high pressures for future use of energy storage materials; and the modelling of the interplay between health, financial resources and labour market behaviour in the later part of working life.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$7.16 million
Ontario Innovation Trust (OIT)	$7.16 million
Ontario Research and Development Challenge Fund (ORDCF)	$0.46 million

Western

The Canadian Language and Literacy Research Network

Communication and literacy skills provide the foundation for effective social functioning and for academic, occupational/economic and life success. When children fail to develop good language and reading skills, there are a range of profound and enduring consequences, including academic failure and dropping out of school, poor psycho-social development, and diminished self esteem and sense of well-being. All of these reduce the opportunities for lifelong success.

Good language and literacy skills are also essential to the economy. Employers state that their top three employee requirements are good communication skills, the ability to learn and literacy. Unfortunately, recent Statistics Canada reports indicate that more than 20% of Canadian high school graduates lack the literacy skills needed for entry-level jobs and experience difficulties reading even simple texts for comprehension. Another 25% of Canadians can read only simple printed material.

Hosted at Western, the Canadian Language and Literacy Research Network (CLLRNet) is a new venture for Canada that brings public and private sector partners together with 90 leading scientists, clinicians and educators representing various disciplines studying early language, communication and literacy development. The broad objectives of the Network are to improve understanding and find ways of identifying children who are at risk of failing to develop adequate language, communication and literacy skills, which, if not addressed, reduces their potential to succeed in school and function effectively as adults in society.

Established in 2001 and funded by the federal government's **Networks of Centres of Excellence Program**, CLLRNet is incorporated as a not-for-profit corporation, and governed by a board of directors drawn from backgrounds in business, law, accounting, health care, media, academia and government.

Collectively, the CLLRNet researchers conduct research that is designed to:

- ❒ Improve basic understanding of the neural, sensory, perceptual, cognitive, developmental and social processes that are involved in normal language and literacy development and that are the bases for various types of language and literacy disorders;
- ❒ Identify young children at risk;
- ❒ Improve assessment and methods for differential diagnosis;
- ❒ Evaluate and improve different interventions that are appropriate for specific groups of children;
- ❒ Develop new software products and technologies for assessment and training; and

- Examine the effects of interventions and different social conditions on the development of language and literacy processes through longitudinal studies of language and literacy development in normal and abnormal populations.

The researchers also work to develop effective ways to communicate the results of their research to education and health professionals, care givers, families of young children and the research community, and to find ways to positively influence policies and practices for early childhood education and intervention strategies at the provincial, territorial and national levels.

In addition, CLLRNet directly assists the development of highly qualified personnel in Canada by contributing to the training and education of specialists in language and literacy, and by facilitating the transfer of research outcomes to the educators who have contact with children.

CLLRNet achieves these goals in part by investing in multidisciplinary projects that have clear goals and objectives, and through investments in critical core facilities. The Network both develops and makes available complex technologies that would otherwise not be accessible to individual researchers. CLLRNet provides matching funds for training of students in the language and literacy field, and helps create linkages among the research, education, clinical and partner communities that ensure the timely transfer of research findings into practice. The Network also works to promote partnerships with industry, health advocacy groups, other not-for-profit organizations and government.

FUNDING:
Federal Networks of Centres of Excellence

VALUE:
$14.2 million over 4 years

Western

Ensuring quality primary medical care for Canadians

Dr. Moira Stewart, Director

Developing research skills and information in the field of primary-based medical care is the goal of Dr. Moira Stewart, Western researcher and professor. Primary care is the first point of contact for most Canadians seeking medical care and is increasingly interdisciplinary in nature. Yet the research base in this critical field is minimal. Dr. Stewart is working with a multidisciplinary team at Western's renowned Centre for Studies in Family Medicine to address this problem and, consequently, to improve the quality of patient care in Canada.

Funded with a six-year, $1.75 million Strategic Training Grant from the **Canadian Institutes of Health Research**, Dr. Stewart and collaborators from Western, McMaster and Dalhousie universities have been intensively engaged in seeking mechanisms for improving the evidence-base for primary health care. Specifically, their work seeks to build a critical mass of skilled, independent researchers through both student opportunities and faculty development, and to augment the interdisciplinary and transdisciplinary focus in primary health care research.

Training programs offered through the Centre will primarily be carried out online with workshops focusing on interdisciplinary theory and process and research methods unique to primary health care research. Trainees will include graduate students, mid-career professionals, postdoctoral fellows and exceptional undergraduate students in fields related to primary health care. Ultimately, by increasing the number of well-trained researchers in this area, Dr. Stewart and her colleagues are helping to ensure appropriate care and delivery of care to patients in 10 primary care settings across Canada and beyond.

FUNDING:	VALUE:
Strategic Training Grant from Canadian Institutes of Health Research (CIHR)	$1.75 million

Western

Hearing research speaks volumes

Western's National Centre for Audiology (NCA) is a state-of-the-art audiology and hearing science teaching, research and clinical service facility. Research at the NCA is supported by a grant from the **Canada Foundation for Innovation**, funding from the **Networks of Centres of Excellence Program**, as well as grants and contracts from private-sector partners.

Currently, the Centre has five primary laboratories, plus an active community hearing clinic. Facilities include the Amplification Systems Laboratory, where Professors Don Jamieson, Vijay Parsa and Richard Seewald have conducted research to evaluate and improve hearing aids and other assistive listening devices. The Child Amplification Laboratory, directed by Canada Research Chair Richard Seewald, has developed techniques that are now being applied to select and fit hearing aids in clinics throughout the world.

The Child Hearing Research Laboratory, led by Prof. Prudence Allen, is the site for studies on the development of hearing and listening abilities in young children, while Prof. Margaret Cheesman's Hearing Science Laboratory has developed a number of improved techniques for assessing speech understanding abilities in both hearing-impaired clients and normal-hearing subjects.

Finally, Prof. Don Jamieson's Speech Communication Laboratory supports research to improve our knowledge of how humans learn, understand and use spoken language. Applications include improved training protocols for English-as-a-second-language groups, and novel interventions for children who have an auditory processing disorder, hearing impairment, specific language impairment or phonological disorder. The laboratory is recognized internationally for the development of innovative software and hardware systems to support spoken language research, including advanced tools for speech and voice analysis, synthesis and processing.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$1.2 million

Dr. Richard Seewald in the National Centre for Audiology

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Western

Working with the community to help children with special needs

The quality of life of school-aged children with special mobility, communication and fine motor skill needs has been enhanced as a result of a new research alliance in London funded by the **Social Sciences and Humanities Research Council's** Community-University Research Alliances (CURA) program. The program is designed to help community organizations and universities to combine forces and tackle issues they have identified as being of common, priority concern.

The London-based project involves researchers and practitioners from a number of local institutions, including the University of Western Ontario, Huron University College, the Child and Parent Resource Institute, the Thames Valley Children's Centre and the Thames Valley District School Board. Western researchers involved in the project include Professors Doreen Bartlett, Marilyn Kertoy and Linda Miller, all from the Faculty of Health Sciences.

The Research Alliance will look for practical ways to enhance the quality of life of school-aged children with special needs by considering factors affecting the manner in which they function and participate in school and the broader community; effective ways of providing therapy services; and strategies to change attitudes and increase awareness in the community.

The Research Alliance will offer new interdisciplinary, research training opportunities for university students and community-based therapists and teachers to enhance their research skills and foster the practical applications of the team's work.

Once research is completed, the Research Alliance will provide opportunities for professionals, families of children with special needs and the community to learn about the results of CURA studies through workshops, information sessions, discussion groups and newsletters.

FUNDING:	VALUE:
Community-University Research Alliances (CURA)/ Social Sciences and Humanities Research Council (SSHRC)	$570,000

Research Alliance
for Children with Special Needs
◆ TVCC ◆ UWO ◆ TVDSB ◆
◆ CPRI ◆ HURON ◆

Wilfrid Laurier University

Combating nausea from chemo

The development of chemotherapy treatment has prolonged the lives of many cancer patients. But significant side effects of nausea and vomiting often interfere with successful completion. Chemotherapy patients report not only acute nausea and vomiting during treatment, but also anticipatory nausea and vomiting upon re-exposure to the cues associated with the treatment. The more intense the initial acute nausea, the worse is the anticipatory nausea.

Anticipatory nausea and vomiting (ANV) is best understood as a classically conditioned response; that is, cues present at the time of exposure to the toxin acquire aversive properties as the result of the pairings. Anti-vomiting treatments, such as the drug ondansetron, which effectively attenuate unconditioned nausea and vomiting produced by the treatment, do not reduce conditioned nausea when administered prior to a chemotherapy session. Little is understood about the pharmacological treatment of ANV.

Dr. Linda Parker

Grants from the **Canada Foundation for Innovation**, the **Canadian Institutes of Health Research (CIHR)** and the **Natural Sciences and Engineering Research Council** support Dr. Linda Parker's efforts to help cancer patients. Funding from these sources and others has allowed Dr. Parker to establish the only colony of Suncus murinus (musk shrew) in Canada.

Animal models of vomiting have been critical to the development of pharmacological treatments to reduce nausea and vomiting in human patients. Although rats and mice are not capable of vomiting, considerable research with dogs, cats and ferrets has resulted in the development of highly effective anti-vomiting treatments. Research with animals capable of vomiting is limited by the cost of housing relatively large animals, which reduces the number of animals that may be included in a study. But an animal model of emesis (vomiting) has been developed with the mouse-sized Suncus murinus. The animal retches and vomits when administered most emetic treatments.

Testimony of numerous patients indicates that marijuana reduces both acute and anticipatory nausea and vomiting associated with chemotherapy, thereby maintaining the resolve to continue with therapy. The results of early clinical trials indicate that pure delta-9-tetrahyrocannabinol (THC) and the synthetic cannabinoid, naboline (an analogue of THC), reduce unconditioned nausea and vomiting induced by chemotherapy treatments. But THC's ability to interfere with ANV has not been specifically evaluated. Since establishing the Suncus murinus colony, Dr. Parker received CIHR funding to evaluate the potential of cannabinoid (CB) agents to interfere with vomiting and retching produced by toxins, and to interfere with conditioned vomiting and/or retching as an animal model of ANV.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$117,869
Canadian Institutes of Health Research (CIHR)	$204,664
Natural Sciences and Engineering Research Council (NSERC)	$161,380

Wilfrid Laurier University

Forecasting spatial movements

With funding from the **Canada Foundation for Innovation, Social Sciences and Humanities Research Council** and other sources, Dr. Sean Doherty has been able to explore new frontiers in the study of human activity and travel behaviour, collaborating on a much larger scale within and outside of Canada and immersing a growing number of students in creative projects that give them a chance to develop their skills.

One of Dr. Doherty's significant contributions has been the development of new computerized social-survey methods. This development has recently come to include the use of GIS (Geographic Information Systems) and GPS (Global Positioning Systems) technologies to overcome a long-standing barrier in his field—to somehow trace the scheduling decision process that underlies observed patterns of human activity and travel or, in other words, to track what people do and understand why they do it. So innovative are these methods that that they have been adopted by the collaborative research teams in Canada, Europe, the U.K. and the U.S.

The data collected using these new methods offer greater depth than traditional methods and requires new analysis methods. Federal funds have allowed Dr. Doherty to lead a much larger number of students and collaborative teams in fully utilizing this data. The result is a growing number of new insights into how people organize their lives, make decisions and adapt to new situations. The research also contributes to the development of improved urban forecasting models capable of assessing the impact of emerging trends such as e-commerce, and the identification of practical everyday advice to assist people with their work-life management.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$60,800
Social Sciences and Humanities Research Council (SSHRC)	$186,100

(left to right) Kim Tran, Dr. Sean Doherty and Erika Nemeth

Wilfrid Laurier University

Memory vs. reconstruction of the past

Dr. Albert Schweitzer is reputed to have observed: "Happiness is nothing more than good health and a bad memory." Research conducted by Dr. Anne Wilson suggests that imperfect memories may indeed contribute to happiness and well-being. Though no one would claim that quality of life is enhanced by forgetting such things as the location of keys, memories of past experiences and personal characteristics are often so cloudy that people use considerable poetic license to interpret their life stories.

Memory researchers have long recognized that recalling the past is not like playing back videotape. Many details are never stored in memory in the first place, and those that are can be difficult to retrieve. Some researchers have suggested that recall is more a matter of reconstruction based on a few "memory fragments." Dr. Wilson's research has focused on how people reconstruct and sometimes substantially revise their memories about their past selves and experiences—both what happened, and when it occurred.

She found that people's desire to be happy and satisfied in the present can sometimes influence how they recall the past. If, for example, a woman wants to feel organized and efficient, she may recall her past life as chaotic and disorderly. Her "new, improved" organizational skills will seem all the more impressive. Dr. Wilson has found that people tend to be so gratified by perceiving improvement in themselves that they often recall the past as being even worse than it really was, to create the illusion of continual progress. In other circumstances, people exaggerate the glories of the past, particularly when they feel these former successes still reflect on their current selves. In short, people may indeed be able to capitalize on "bad memory" in the quest for happiness.

Dr. Wilson is currently extending her research on memory, self and psychological well-being in a number of directions. She received funding from the **Social Sciences and Humanities Research Council** to study how a person's remembered past is used as a standard to measure current successes. She is assessing people's use of these remembered standards and other comparison standards (such as when they measure themselves against the successes of other people) at various stages through the life span.

Dr. Wilson has also received funds from the **Natural Sciences and Engineering Research Council** to examine people's memory for time. People often do not store the precise dates in their memories, so they must use strategies to reconstruct when episodes occurred and to retrieve details of the event itself. As Dr. Wilson learns more from these related research pursuits, she will develop a more complete understanding of the complex ways in which people's pasts are connected to their present.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC)	$67,600
Natural Sciences and Engineering Research Council (NSERC)	$40,000

Dr. Anne Wilson

Wilfrid Laurier University

Understanding plant development

Federal funding has allowed two biologists, Dr. Mary Ann Fieldes and Dr. Frédérique Guinel, to expand their research programs in new directions, increase current levels of research activity and develop more collaborative approaches to studies in the genetic and physiological regulation of plant growth and development.

A grant from the **Canada Foundation for Innovation** funded the purchase and installation of several pieces of equipment. Plant-growth chambers provide the uniform, repeatable conditions required for DNA analysis, plant-hormone work and other studies. A high-performance liquid chromatography system and a gas chromatography-mass spectrometry system allow researchers to separate and analyze the relevant plant compounds. The researchers also hold individual awards from the **Natural Sciences and Engineering Research Council** for their individual research and to help train future researchers.

Dr. Fieldes uses plant mutations to study the genetic control of flowering time. Understanding the genes that control plant growth and development and how these genes are regulated is critical to crop breeding. Plant growth and development determine the productivity, yield and economic value of a crop. Her current research involves flax, a crop plant grown in Canada for its seed, which contains linseed oil. She has developed a unique set of mutant lines that flower and mature at an earlier-than-normal age. The current challenge is to work out the normal functions of the genes involved, identify the mutations that cause early flowering, discover how the genes are regulated and determine what role DNA methylation plays in the regulation.

Dr. Guinel studies how a root senses its environment. Scientists are beginning to unravel the mechanisms that regulate the symbiotic interactions between plants and soil microbes. An understanding of the mechanisms could allow farmers and plant breeders to introduce similar symbioses into other crops, reducing the use of agricultural fertilizers. Dr. Guinel is studying how plants regulate the entry of the microbes in the root and has already demonstrated that plant hormones play an important role in the process. She is now trying to understand how these hormones work together to allow microbes to penetrate the outer layer of the root.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$109,419
Natural Sciences and Engineering Research Council (NSERC)	$198,000

Mishi Savulescu and Jonathan Kent

WINDSOR

The associations of health care, social welfare and education policies with the health of diverse North American populations

Dr. Kevin M. Gorey

Dr. Kevin M. Gorey, an epidemiologist and social worker in the University of Windsor's School of Social Work, has won a health career investigator award jointly funded by the **Canadian Institutes of Health Research (CIHR)**, the **Social Sciences and Humanities Research Council (SSHRC)** and **Health Canada**. He is researching how various social systems—health care, social welfare and education—are related to one another, and, specifically, how policy changes in one system affect the other systems as well as the people they are designed to serve. The national award will support Dr. Gorey and his international research team in a series of policy-relevant Canadian and cross-national studies.

First, they plan to bring social and natural scientists together to integratively study the personal and social determinants of population health. Secondly, based on their assumption that in practice the Canadian health care system, like other national systems, is diverse not homogeneous, they will study regional as well as international policy and health variabilities. Thirdly, in addition to studying how policy changes affect the population at large, they will ask specific questions about the relative disadvantages of diverse groups that can be marginalized in various ways: the poor, people of colour, women, immigrants, rural residents and others.

Since the five-year project began in July 2001, the University of Windsor has recruited a human-medical geographer—Dr. Isaac Luginaah—who will collaboratively extend Dr. Gorey's research. Dr. Luginaah's partnership appointment has also been jointly funded for five years by **CIHR**, **SSHRC** and **Health Canada**. In addition to the advancement of his own environmental health research, Dr. Luginaah will add interdisciplinary breadth to Dr. Gorey's research team that already includes social and natural scientists as well as physicians and allied health professionals. Dr. Gorey has also won a supporting **SSHRC** grant that will be used to train graduate students.

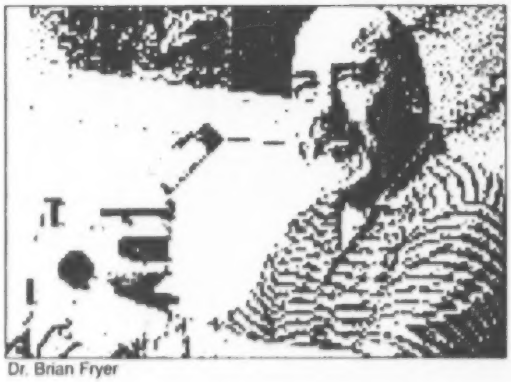
FUNDING:	VALUE:
Canadian Institutes of Health Research (CIHR); Social Sciences and Humanities Research Council (SSHRC); Health Canada	$692,000

WINDSOR

Facility for tracking environmental earth sciences research

Dr. Brian Fryer and co-workers from the Department of Earth Sciences received funding from the **Canada Foundation for Innovation (CFI)** for their research project entitled Geographic/Spatial Information Systems and Related Research Equipment: Environmental Earth Sciences. This award has enabled a diverse group of researchers and their students to generate new types of data sets and link them through common geospatial data bases.

This research facility provides campus-wide access to state-of-the-art GIS (Geographic Information Systems) software and, for earth and environmental research scientists, new approaches to generating and addressing complex data sets on the earth. Research projects include using the microchemistry of fish ear bones (otoliths) to track spawning success of walleye and yellow perch in the Lake Erie commercial fishery; monitoring the environmental impact of contaminant migration in wet lands; studying the bioavailability of toxic metals in sediments from areas of concern in the Great Lakes; and other projects as diverse as monitoring the fluid evolution in mineral deposits and evaluating the efficiency of public transit schedules and routes.



Dr. Brian Fryer

In addition to enhancing the research capabilities of existing faculty, the award has enabled recruitment of four new faculty to the department based on capabilities of the upgraded research environment. Specific enhancements include new stable isotope and rock/sediment magnetic measurement laboratories, an image analysis facility, laser ablation optics for solid sampling at the micrometer scale, a large capacity GIS server and high-speed computer networking links.

FUNDING:	VALUE:
Canada Foundation for Innovation (CFI)	$499,680

WINDSOR

Answering questions about atoms, molecules and clusters

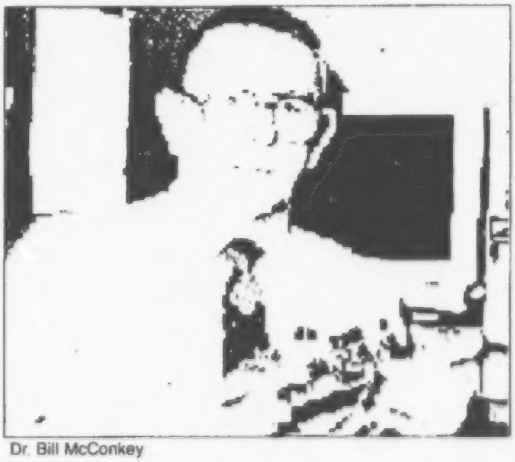
Dr. Bill McConkey of the Department of Physics has received funding from the **Natural Sciences and Engineering Research Council** for the study of Electron and Photon Collision Phenomena in Atoms, Molecules and Clusters.

His research aims to find answers to such basic questions as: What are the mechanisms responsible for the northern lights? How can plasma etching of integrated circuits be made more efficient? In what ways do molecules like water break up, and what are the chances of getting particular fragments when they do? What happens to the electrons that are released when X-rays or other forms of high-energy radiation enter our bodies? How can laser cooling and atom traps be used to obtain useful information about collision processes? How can beams of nitrogen atoms be made for industrial or scientific use? How are clusters different from solids or gases of the same material?

His laboratory is world renowned as a source of quantitative information about basic atomic and molecular processes and is a fertile environment for training graduate students and postdoctoral fellows. Many of the experiments are designed to provide accurate data for the refinement of current theoretical ideas. Close collaboration is maintained with other scientists in Canada and around the world.

A major recent thrust has been the development of a magneto-optical trap (MOT) in which Cesium atoms are cooled to temperatures very close to absolute zero. Electron-impact cross sections involving the atoms in the trap are readily obtained. Suitable adjustment of the trap parameters has allowed cross sections involving excited states—in addition to the more usual ones involving ground state targets—to also be obtained.

FUNDING:	**VALUE:**
Natural Sciences and Engineering Research Council (NSERC) Operating Grant	**$384,800**



Dr. Bill McConkey

WINDSOR

Study of public policies on health, safety and well-being

Dr. Jacqueline Lewis

Drs. Jacqueline Lewis and Eleanor Maticka-Tyndale of the University of Windsor and Dr. Frances Shaver of Concordia University have received a research grant from the Social Sciences and Humanities Research Council (SSHRC) to study Canadian public policy and the health and well-being of sex workers. Prof. Leigh West of the University of Windsor's Faculty of Law is also collaborating on the project.

The overall goal of this study is to develop an understanding of the way public policies in the areas of health, social service, employment, policing, municipal regulations, federal law and immigration affect health, safety and well-being. The study uses occupations in the sex industry for this purpose because a wide diversity of levels and types of policies affect the lives of sex workers. A current and growing body of research and commentary is available on health and safety factors related to sex work, and there are community organizations with frontline experience dealing with health and safety factors related to sex work.

It is expected that the three-year project will develop methods to examine a wide range of public policies from the perspective of their impact on health, safety and well-being. It will also provide in-depth information on how various policies affect sex work and develop guidelines to maximize health, safety and well-being in the sex trade.

To date, training workshops have been held for research assistants and interested community partners. Teams of researchers in Toronto and Montreal have conducted over 90 interviews, and more are planned. Information, documents and materials, such as legislation, court cases, reports, by-laws, policy documents and newspaper articles related to sex work, are currently being archived for a policy and program analysis relevant to the project goal.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council (SSHRC)	$352,424

YORK UNIVERSITY

redefine THE POSSIBLE.

Real-world solutions that may restore vision, increase mobility, even improve your golf score

What would life be like if we fully understood the mechanisms of hand-eye co-ordination? Wouldn't we be able to improve things like vision, mobility and, yes, even our handicap on the golf course? These are a few of the things that Douglas Crawford, York University professor of psychology and Canada Research Chair in Visual-Motor Neuroscience, has been working on lately.

Professor Crawford, who discovered the rules that govern 3-D rotation of the eye, has shown how the brain enables us to recognize what an object is and where it is relative to ourselves and other objects. This work has significant implications in the treatment of medical conditions related to brain function, and in the development of prosthetic devices that can effectively duplicate human visual and motor function. Professor Crawford's work could ultimately lead to the development of devices capable of restoring vision for the blind or mobility for the crippled.

York's interdisciplinary approach to research cuts across the departments of biology, kinesiology, computer science and biomedical engineering.

The Canadian Institute for Advanced Research has recognized Professor Crawford as one of Canada's top 20 researchers, aged 40 and younger, working in science and engineering today.

FUNDING:	VALUE:
Canadian Institutes of Health Research (CIHR)	$1,007,401
Canada Research Chair (CRC)	$700,000
Natural Sciences and Engineering Research Council (NSERC)	$150,000

Prof. Douglas Crawford (left)

YORK UNIVERSITY

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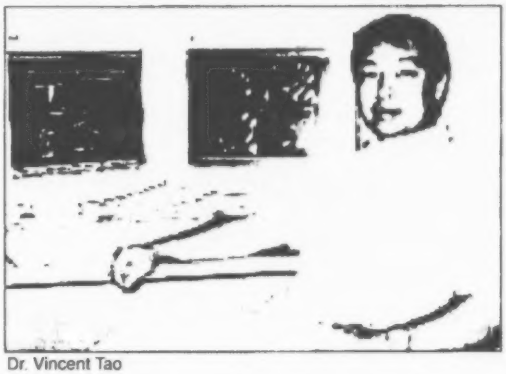
It's every commuter's dream come true: more green lights, fewer red ones

The next time you wonder about the fastest way home, consider the work being done by Dr. Vincent Tao in Geospatial Information and Communication Technologies. As a Canada Research Chair in Geomatics Engineering, Dr. Tao is investigating the methodologies, algorithms and procedures that will increase the flow of traffic, monitor environmental conditions, even locate a missing person.

Dr. Tao's work contributes to geomatics technology by integrating modern information and communication technologies. It has real-world implications, including innovative applications and economic growth in Canada and beyond. As information commerce generates a staggering amount of data about citizens and markets, this data will have a profound impact on applications such as emergency responses, urban mapping, energy exploration and wildlife tracking.

Government agencies, private industry and even the United Nations currently employ software developed by Dr. Tao and his research team.

FUNDING:	VALUE:
Canada Research Chair through Natural Sciences and Engineering Research Council (NSERC)	$500,000
Canada Foundation for Innovation/ Ontario Innovation Trust (CFI)/(OIT)	$250,000



Dr. Vincent Tao

YORK UNIVERSITY

redefine THE POSSIBLE.

Is Yonge and Bloor any different in Berlin?

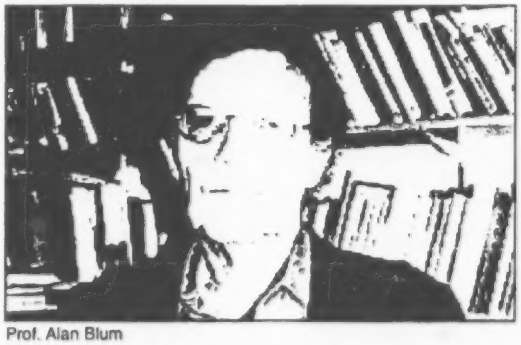
As globalization makes its mark on the world, researchers are pressed into finding ways to help us maintain civility, social stability and identity in our major cities. How is a city more than the sum of its shopping malls, architecture and population mix? How can cities continue to maintain civility among their many and disparate groups, and how can our understanding of each city's essential rhythm inform public policy?

At this crucial stage of our social evolution, a team of international scholars led by York University researcher Alan Blum will attempt to answer these questions, looking at the cities of Toronto, Montreal, Berlin and Dublin. According to Professor Blum, "It is essential to human growth and to the health of our societies that we determine how to preserve this sense of place and deal with global changes on local terms."

Professor Blum's research is interdisciplinary. It brings together eminent scholars in economics, sociology, urbanology, anthropology, philosophy, law, literature and the visual arts. This ground-breaking look at urban life in all its facets represents a major departure from traditional modes of urban study as a simple function of politics, economy and ecology.

According to Professor Blum, the studies will embrace culture as the driving force of city life and the lens through which we understand it.

FUNDING:	VALUE:
Social Sciences and Humanities Research Council of Canada (SSHRC)	$2,403,500



Prof. Alan Blum

YORK UNIVERSITY

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A woman's place is in the global economy

What does globalization mean for women and work in Canada? That's the question foremost in the mind of Dr. Leah Vosko, the recipient of the **Canada Research Chair** in Feminist Political Economy at York University.

Dr. Vosko is one of Canada's leading experts on the changing dynamic of women's paid and unpaid work. Her research includes a comparative study entitled Rethinking Feminization that examines global employment trends through the lens of gender and their effects on public policy.

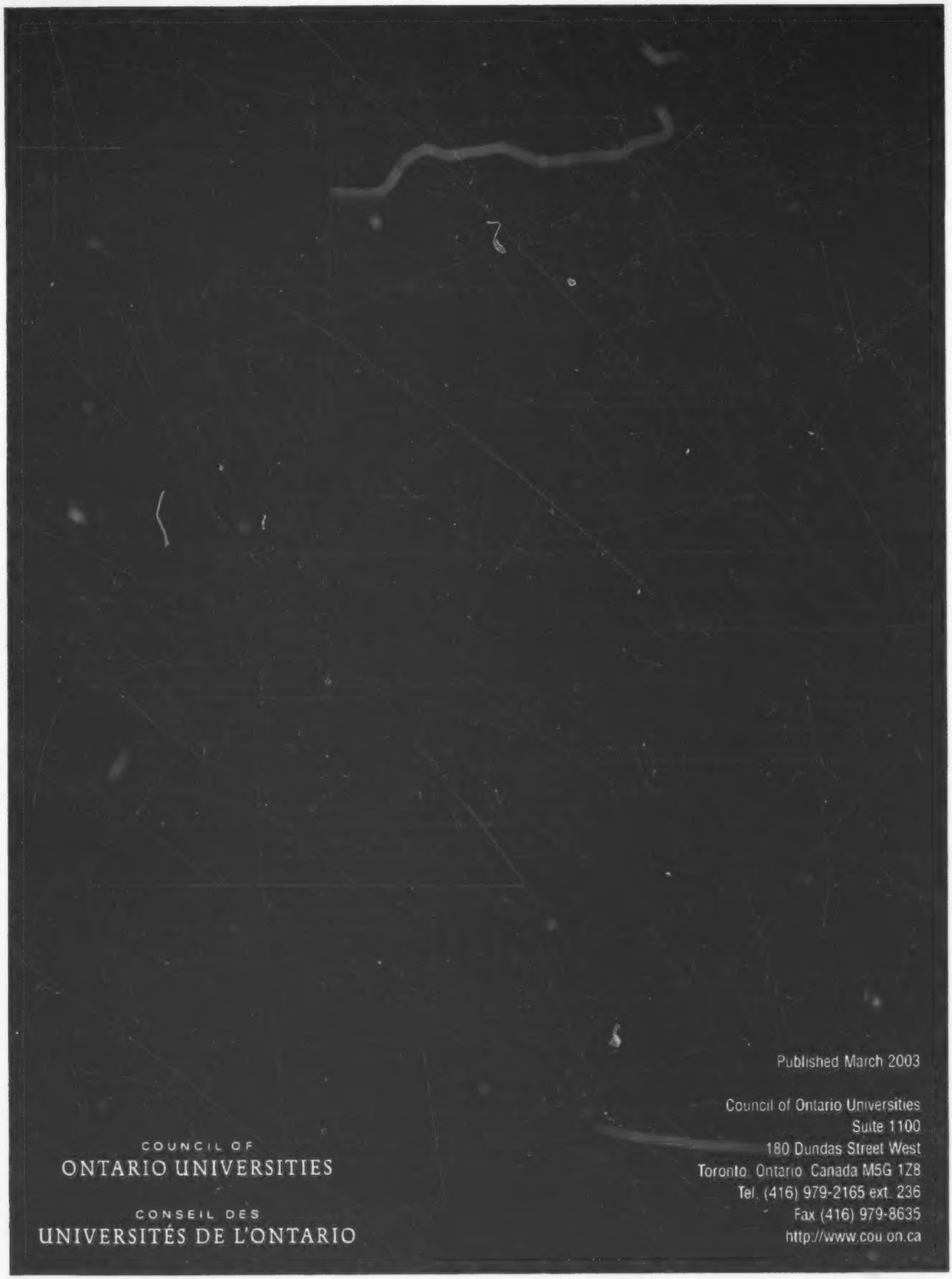
Complementing this work is a large-scale collaborative research initiative that Dr. Vosko directs—a Community University Research Alliance on Contingent Work—whose aim is to foster new social, legal and statistical understandings of insecurity in the Canadian labour market. Dr. Vosko and her colleagues from four universities and seven community groups are examining what is precarious employment and how we can re-regulate the Canadian labour market to improve the conditions of workers at its margins.

Dr. Vosko's research extends across the disciplines of history, law, geography, political science, women's studies and environmental studies.

FUNDING:	VALUE:
Canada Research Chair	$625,067
Social Sciences and Humanities Research Council (SSHRC)	$696,635*

*This figure includes the amount from her Strategic Grant that was transferred to York. It does not include the total amount she was actually awarded while at McMaster.

Dr. Leah Vosko



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